SELECTED
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RESOURCES
ABSTRACTS

VOLUME 8, NUMBER 17
SEPTEMBER 1, 1975

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W75-08351 — W75-08850

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal **is**, and other information services will be, derived; these services include **bibliographies**, specialized indexes, literature searches, and state-of-the-art **reviews**.

Comments and suggestions concerning the contents and arrangements of this **bulletin** are welcome.

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SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

OPTICAL CONSTANTS OF WATER IN THE IN-FRARED,
Kansas State Univ., Manhattan. Dept. of Physics.
H. D. Downing, and D. Williams.
Journal of Geophysical Research, Vol 80, No 12, p 1656-1661, April 20, 1975. 3 fig, 1 tab, 15 ref.

Descriptors: *Optical properties, *Infrared radiation, *Refractivity, Reflectance, Atmosphere, Absorption, Drops(Fluids), Heat balance, Water properties, Interferometry, Instrumentation, Wavelengths, Remote sensing, Frequency.
Identifiers: *Scattering, *Spectral ranges, Wave numbers.

The results of earlier studies of reflection and absorption in various spectral regions were reviewed and then used to provide values of the complex index of refraction $N = n + ik$ of water at 27C in the spectral range 5000-10/cm, corresponding to wavelengths in the range 2 micro m to 1 mm. Values of n, k, and the Lambert absorption coefficient alpha, which were presented graphically and in tabular form, should prove useful in studies of the scattering of infrared radiation by water droplets in the atmosphere and in studies of radiative heat balance at water surfaces. (Huff-ISWS)
W75-08422

KRAMERS-KRONIG ANALYSIS OF RATIO REFLECTANCE SPECTRA MEASURED AT AN OBLIQUE ANGLE,
Missouri Univ., Kansas City. Dept. of Physics.
M. R. Querry, and W. E. Holland.
Applied Optics, Vol 13, No 3, p 595-598, March 1974. 3 fig, 7 ref. OWRR A-058-MO(3). 14-01-0001-3825.

Descriptors: *Reflectance, *Optical properties, *Water properties, *Refractivity, Infrared radiation, Microwaves, Measurement, Absorption, Algorithms.
Identifiers: Absorption coefficient, Ratio reflectance spectra, Kramer-Kronig analysis.

Ratio reflectance R is defined as R=Rp/Rs, where Rp and Rs are absolute specular reflectances of a material for electromagnetic waves linearly polarized with the electric field vector parallel and perpendicular to the plane of incidence, respectively. An algorithm was developed for computing both the index of refraction n and extinction coefficient k from an R spectrum obtained for radiant flux incident on a plane surface of the material at an oblique angle in the range 10 deg phi less than or equal to 45 deg. Kramers-Kronig (K-K) analysis of the R spectrum provides spectral values of delta phi(=)phi -phi sub S, the difference between phase shifts due to reflection of the two separate polarization components. Real and imaginary parts of a Fresnel equation for the ratio reflectivity provide equations for computing n and k when R, theta, and delta phi are known quantities. A synthetic R spectrum for water was generated by appropriate use of n and k values for that substance and the generalized Fresnel equation for ratio reflectance. The algotithm, when applied to the synthetic R spectrum, returned values of n and k for water in the 25,000-500 cm-1 wavenumber interval that were primarily limited in their accuracy by the interval size used for Simpson's rule numerical approximation of the K-K integral.
W75-08601

2. WATER CYCLE

2A. General

THE ESTIMATION OF (RHO) IN THE FIRST-ORDER AUTOREGRESSIVE MODEL: A BAYE-SIAN APPROACH,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Lenton, I. Rodriguez-Iturbe, and J. C. Schaake, Jr.
Water Resources Research, Vol 10, No 2, p 227-241, April 1974. 11 fig, 5 tab, 13 ref. OWRR C-4118(9021)(3).

Descriptors: *Regression analysis, *Stochastic processes, *Markov processes, Synthetic hydrology, Systems analysis, Probability, Variability, Design criteria, Model studies.
Identifiers: Bayes methods.

Three general approaches are given to derive marginal posterior probability density functions for the autocorrelation coefficient of the first-order normal autoregressive model. Bayes estimators can be obtained for a given loss function. The different approaches are based on varying assumptions about the incidental parameters of the model and are shown numerically to be approximately equivalent with respect to their mean and variance. A comparison is made between the Bayes estimator and some classical estimators on the basis of the risk function and the expected risk. The risk functions are determined by Monte Carlo methods for quadratic, symmetric linear, and various asymmetric linear loss functions. The Bayes estimators are shown to be considerably advantageous, especially when the sample size is small. The Bayes estimators are shown to be extremely robust under changes of the loss function. (Knapp-USGS)
W75-08387

SOME COMMENTS ON TESTING RANDOM TOPOLOGY STREAM NETWORK MODELS,
State Univ. of New York, Buffalo. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W75-08437

PARAMETERIZATION OF SURFACE MOISTURE AND EVAPORATION RATE IN A PLANETARY BOUNDARY LAYER MODEL,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2D.
W75-08451

EROSION MODELING ON A WATERSHED,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2J.
W75-08459

PROCESS IN DATA COLLECTION AND DISSEMINATION IN WATER RESOURCES, 1964-1974,
Geological Survey, Reston, Va. Office of Water Data Coordination.
For primary bibliographic entry see Field 7A.
W75-08505

EFFECT OF ATMOSPHERIC STABILITY AND WIND DIRECTION ON WATER TEMPERATURE PREDICTIONS FOR A THERMALLY-LOADED STREAM,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W75-08576

ASPECTS OF HYDROLOGICAL EFFECTS OF URBANIZATION.
American Society of Civil Engineers, New York. Task Committee on the Effects of Urbanization on Low Flow, Total Runoff, Infiltration, and Ground-Water Recharge.
For primary bibliographic entry see Field 4C.
W75-08697

DYNAMIC BEHAVIOR MODEL OF EPHEMERAL STREAM,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-08699

THE SEASONAL VARIATION OF THE HYDROLOGIC CYCLE AS SIMULATED BY A GLOBAL MODEL OF THE ATMOSPHERE,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
S. Manabe, and J. L. Holloway, Jr.
Journal of Geophysical Research, Vol 80, No 12, p 1617-1649, April 20, 1975. 32 fig, 1 tab, 42 ref.

Descriptors: *Model studies, *Atmosphere, *Hydrologic cycle, *Simulation analysis, Evaporation, Temperature, Winds, Water vapor, Moisture, Soil moisture, Snow cover, Arid lands, Snow, Seasonal, Numerical analysis, Hydrology, Climates, Precipitation(Atmospheric), Snowmelt, Wet climates, Runoff, Tropical regions, Mountains, Water balance, Latitudinal studies.
Identifiers: *Global model, Insolation, Grid network, Continents, Koppen climate types.

A numerical model was demonstrated to be capable of reproducing many of the basic features of the seasonal variation of hydrology and climate on a global scale. The model of the atmosphere with a seasonal variation of insolation and sea surface temperature was integrated for over 3 simulation years on a finite difference grid network having a nearly uniform horizontal resolution of about 265 km. There were 11 levels in the model from 80 m to 31 km above the ground, with realistic continents having smoothed topography. In addition to wind, temperature, pressure, and water vapor, the model simulated rainfall, snowfall, and evaporation at the surface. The simulated precipitation and other hydrologic quantities were compared with those derived from observed data. In addition, the correspondence between the distribution of precipitation rate and those of other relevant quantities, such as sea level pressure and kinetic energy of transient disturbances, was examined. Sensitivity studies of this character can help determine the strategy for further improvements of the parameterization of hydrologic processes. (Roberts-ISWS)
W75-08704

THE TIDAL ENERGETICS OF NARRAGAN-SETT BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W75-08705

DEVELOPMENT OF A WATER PLANNING MODEL FOR MONTANA,
Montana State Univ., Bozeman. Dept. of Industrial Engineering and Computer Science.
For primary bibliographic entry see Field 6A.
W75-08811

WINTER STORM AND FLOOD ANALYSES, NORTHWEST INTERIOR,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-08818

CALIBRATION OF WATERSHED WETNESS AND PREDICTION OF FLOOD VOLUME FROM SMALL WATERSHEDS IN HUMID REGION,

Pennsylvania Dept. of Environmental Resources, Harrisburg.
S. L. Chiang.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 371-382, 1973. 6 fig, 13 ref.

Descriptors: *Flood discharge, *Runoff, *Moisture content, Floods, Volume, Forecasting, Equations, Watersheds(Basins), Precipitation(Atmospheric), Antecedent precipitation, Antecedent moisture content, Temperature, Evapotranspiration, Vegetation effects, Hydrology, Meteorology, Pennsylvania.

Given a storm total, the runoff volume of a watershed is mainly determined by the antecedent wetness of the watershed. Various investigations have shown that there is no relationship between the return period of a rainfall and the return period of the peak resulting from the rainfall. Since the peak is directly related to runoff volume, it can be concluded that the antecedent watershed wetness is mostly responsible for the difference. Calibration of watershed wetness is fundamental to volume prediction which is, in turn, a prerequisite to peak prediction. The objective of the study was to develop storm runoff volume prediction equations through a process by which watershed wetness can be calibrated. For comparison, another approach requiring a direct correlation between the runoff volume and its causal factors was developed. (See also W75-08786) (Sims-ISWS)
W75-08819

THE IHD--TEN YEARS OF PROGRESS,

National Committe for the International Hydrological Decade, Washington, D.C.
L. A. Heindl.
In: A Decade of Progress in Water Resources: American Water Resources Association Proceedings Series No 19, p 10-16, March 1974. 1 ref.

Descriptors: *International Hydrological Decade, *Reviews, *Hydrology, Foreign countries, Data collections, Information exchange, Long-term planning, Water resources, Economics, Education.
Identifiers: *IHD accomplishments.

The International Hydrological Decade (IHD) ends this year (1974). Its principal international success appears to have been its use to enhance and enlarge hydrological services in many countries around the globe. As a result, there will be greatly increased sources of water data for scientific studies and social and economic applications. In North America, the outstanding success has been the International Field Year for the Great Lakes, conducted together with Canada. The Decade worked a gradual but definite shift in emphasis from scientific research to beneficial applications of scientific technology, particularly in developing countries. Recognizing the overall accomplishments of the Decade, the United Nations Educational, Scientific and Cultural Organization (UNESCO) will launch an open-ended International Hydrological Program (IHP) beginning in 1975. The United States has voted to participate in the IHP. The main objectives of the IHP paraphrase those of the Decade. (Woodard-USGS)
W75-08829

2B. Precipitation

PRECIPITATION CHARACTERISTICS IN THE NORTHEAST BRAZIL DRY REGION,

Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
R. P. L. Ramos.
Journal of Geophysical Research, Vol 80, No 12, p 1665-1678, April 20, 1975. 17 fig, 5 tab, 24 ref. NSF Grants GA-32589X2, GA-29147.

Descriptors: *Precipitation(Atmospheric), *Climatology, *Rainfall disposition, *Meteorology, Cloud cover, Temperature, Pressure, Winds, South America, Geographical regions, Atmosphere, Moisture content, Satellites(Artificial), Rainfall, Tropical regions.
Identifiers: *Diurnal rainfall distribution, *Brazil.

The general meteorological conditions and precipitation characteristics in the Northeast Brazil dry region during its rainy season from December through April were discussed. It was found that most of the yearly rainfall comes in six to eight episodes from organized weather systems which move from east to west with about the same speed (approximately 5 m/s) as the lower tropospheric wind flow. These systems appear not to be of local origin. Rainfall was shown to be inversely correlated with the regional subsidence. An interesting and previously unknown diurnal rainfall variation was found. Orographic influences appear to act to modulate the weather systems and develop upslope and downslope winds. This produces rainfall in the morning over the lowland regions and in the afternoon over the hills and more elevated regions. Extensive comparisons of the rain systems with other tropical regions were made. Other characteristics were discussed. (Huff-ISWS)
W75-08421

OPTICAL CONSTANTS OF WATER IN THE INFRARED,

Kansas State Univ., Manhattan. Dept. of Physics.
For primary bibliographic entry see Field 1A.
W75-08422

EXTREME WAVE CONDITIONS DURING HURRICANE CAMILLE,

Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 2L.
W75-08427

A STOCHASTIC ANALYSIS OF EXTREME DROUGHTS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. K. Gupta, and L. Duckstein.
Water Resources Research, Vol 11, No 2, p 221-228, April 1975. 9 fig, 1 tab, 19 ref. NSF Grants GK-35915, GK-35791.

Descriptors: *Stochastic processes, *Droughts, *Model studies, Dry seasons, Probability, Rainfall, Hydrology, Precipitation(Atmospheric), Theoretical analysis, Numerical analysis, Rainfall intensity, Regional analysis, Statistical model, Statistical methods.
Identifiers: Poisson process.

A stochastic analysis was performed on the extreme drought duration defined to be the maximum dry interval for a point rainfall process. The assumptions underlying previous analyses were generalized to those of a nonhomogeneous Poisson process. Analytical results, which seem intractable in general, were derived for two particular forms of the intensity function of the Poisson process; for a general intensity function, simulation was recommended. Next, small time intervals such as the growing season of a crop were considered so that the assumption of a homogeneous Poisson rainfall process could be made and the ef-

fect of parameter estimation on the theoretical results could be studied qualitatively. To illustrate this point, four estimates of the intensity parameter were calculated by using precipitation data from Chicago and Austin. A good agreement was found between the theoretical and empirical distribution functions for the two parameter estimates calculated by use of the developed model; on the other hand, a substantial bias was present for parameters calculated directly from the data. Finally, an approach was schematically indicated to extend the model to regional droughts by using stochastic superposition. (Dawes-ISWS)
W75-08433

EVALUATION OF THE REPRESENTATIVENESS OF THE PRECIPITATION NETWORK IN RELATION TO THE SPATIAL INTERPOLATION OF PRECIPITATION,

V. A. Rumyantsev, and S. V. Shanochkin.
Soviet Hydrology, Selected Papers No. 3, p 199-206, 1973. 3 fig, 8 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 196, p 215-227, 1973.

Descriptors: *Regional analysis, *Networks, *Precipitation(Atmospheric), *Statistical methods, Least squares method, Statistics, Hydrologic aspects, Spatial distribution, Rainfall disposition, Diurnal distribution, Seasonal.
Identifiers: *USSR, Network density.

One major obstacle to improving the accuracy of hydrologic computations and forecasts is the low density of the precipitation network. The representativeness of the network with respect to the problem of spatial interpolation was evaluated from corrected views on the statistical structure of precipitation fields. The least squares principle, in which the average of the sum of squares of deviations is interpolated from actual values, was taken as a measure of dispersion. The representativeness of the precipitation network was evaluated from the data for two regions: the Valdai Hills and the Central regions. Investigated was precipitation over semidiurnal, diurnal, 10-day, and seasonal summation periods. The estimated correlation functions for the interpolation of precipitation values at points having observational data and a comparison of the reconstructed with the actual values showed that, with the exception of small number of cases, the root-mean-square errors obtained by computation are close to the actual errors. This indicates that the estimates of the correlation functions are adequate and that it is possible to use them to interpolate precipitation values at points where direct observations are not obtained. Results showed that the optimum network density required one station per 16 sq km for diurnal precipitation and one station per 550 sq km for seasonal precipitation. Such a dense precipitation network would be difficult to justify economically. It was recommended that several experimental precipitation measuring areas be created and coordinated with radar methods and meteorological satellites to study the statistical structure of precipitation fields. (Humphreys-ISWS)
W75-08444

PARAMETERIZATION OF SURFACE MOISTURE AND EVAPORATION RATE IN A PLANETARY BOUNDARY LAYER MODEL,

National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2D.
W75-08451

A DIRECT SOLUTION OF THE SPHERICAL-HARMONICS APPROXIMATION TO THE TRANSFER EQUATION FOR A PLANE-PARALLEL, NONHOMOGENEOUS ATMOSPHERE,

California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-08661

THE SEASONAL VARIATION OF THE HYDROLOGIC CYCLE AS SIMULATED BY A GLOBAL MODEL OF THE ATMOSPHERE,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2A.
W75-08704

METEOROLOGY AND HYDROLOGY OF RAPID CITY FLOOD,
Corps of Engineers, Omaha, Nebr. Hydrology and Meteorology Section.
For primary bibliographic entry see Field 2E.
W75-08824

2C. Snow, Ice, and Frost

ECOLOGY OF THE GREEN KRYOPHILIC ALGAE FROM BELANSKE TATRY MOUNTAINS (CZECHOSLOVAKIA),
Ceskoslovenska Akademie Ved, Trebon. Inst. of Microbiology.
For primary bibliographic entry see Field 5C.
W75-08393

CONCERNING THE EFFECT OF ANISOTROPIC SCATTERING AND FINITE DEPTH OF THE DISTRIBUTION OF SOLAR RADIATION IN SNOW,
High Altitude Observatory, Boulder, Colo.
B. R. Barkstrom, and C. W. Querfeld.
Journal of Glaciology, Vol 14, No 70, p 107-124, 1975. 6 fig, 1 tab, 23 ref, 1 append.

Descriptors: *Snow, *Model studies, *Solar radiation, Reflectance, Mathematical models, analysis, Albedo, Depth, Optical properties, Anisotropy, Radiation, Diffusivity, Isotropy.

It was shown that anisotropic scattering with a strong forward peak can give reasonable agreement with angular reflectance data for snow. As a result of the forward peak, solar radiation penetrates deeper into the medium, when measured in terms of photon mean free paths, than it does for isotropic scattering. The radiation transmitted directly through finite slabs can be seen to an optical depth of seven, and decreases much more rapidly with optical depth than does the diffusely transmitted (scattered) radiation. It was suggested that measurements of the flux extinction coefficient using the light transmitted through finite layers of snow (under 2.5 cm thick) may lead to serious errors if extrapolated to effectively semi-infinite layers below the boundary layer in the latter. An appendix contains mathematical analysis that can be used to develop working numerical routines for computers. (Humphreys-ISWS)
W75-08405

QUATERNARY GLACIATIONS IN THE ANDES OF NORTH-CENTRAL CHILE,
Saskatchewan Univ., Regina. Dept. of Geography.
C. N. Caviedes, and R. Paskoff.
Journal of Glaciology, Vol 14, No 70, p 155-170, 1975. 7 fig, 1 tab, 44 ref.

Descriptors: *Glaciation, *South America, *Quaternary period, Glaciology, Geologic history, Geomorphology, Topography, Mountains, Valleys, Cirques, Glacial drift, Climates, Geology.
Identifiers: *Chile, Andes Mountains, Laguna, Tapado, Portillo, Guardia Vieja, Salto del Soldado.

The extension of the Quaternary glaciations was studied in the semi-arid Andes of north-central Chile, where the glacial modeling is striking. In the Elqui valley (latitude 30S), two glacial advances were identified reaching down to 3100 m (Laguna glaciation) and 2500 m (Tapado glaciation). In the

Aconcagua valley (latitude 33S), moraines from three major glacial advances were found, at 2800 m (Portillo glaciation), 1600 m (Guardia Vieja glaciation), and 1300 m (Salto del Soldado glaciation). The Quaternary glaciations were linked with a decrease of temperature, but more significantly with a marked increase of precipitation probably related to an equatorward shift of 5-6 degrees of the austral polar front. The results obtained in the semi-arid Chilean Andes were correlated with those recently reported from other sectors of the southern Andes. Glacial advances in the Andes of central Chile between latitudes 30S and 41S were tabulated. (Humphreys-ISWS)
W75-08406

LIQUID BRINE IN ICE SHELVES,
Scott Polar Research Inst., Cambridge (England).
R. H. Thomas.
Journal of Glaciology, Vol 14, No 70, p 125-136, 1975. 5 fig, 13 ref, 1 append.

Descriptors: *Ice, *Saline water, *Model studies, *On-site investigations, *Brines, Temperature, Mathematical studies, Flow, Flow rates, *Antarctic, Thermocline, Firn, Percolation, Heat flow.
Identifiers: *Brunt Ice Shelf(Ant).

Holes drilled into thin areas of the Brunt Ice Shelf encounter a layer of liquid brine less than 1 m thick approximately at sea-level. Assuming the brine to be moving horizontally, analysis of its effects on thermal equilibrium gives an estimate of steady-state annual brine flow that is in good agreement with the value deduced from a percolation model. The effect of firn density on percolation rates is such that the slope of an active brine layer increases rapidly as ice thickness increases. However, the heat transport model predicts that brine layers are unlikely to be active in both very thick and very thin ice shelves. An appendix contains mathematical analysis for temperature gradient in the firn, temperature gradient in impure ice, and significance of brine trapped within the superimposed ice. (Humphreys-ISWS)
W75-08407

THE FORMATION OF BRINE DRAINAGE FEATURES IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Oceanography.
L. I. Eide, and S. Martin.
Journal of Glaciology, Vol 14, No 70, p 137-154, 1975. 10 fig, 1 tab, 23 ref, 1 append. NR307-252 ONR Contract N00014-67-A-0103-0007.

Descriptors: *Sea ice, *Laboratory tests, *Brines, Laboratory equipment, Saline water, Ice-water interfaces, Boundaries(Surfaces), Instrumentation, Ice, Channels, Flow, Drainage, Drainage systems, Thermal properties, Freezing.
Identifiers: *Brine pockets.

Laboratory experiments on the growth of sea ice in a very thin plastic tank filled with salt water, cooled from above, and insulated with thermopane, clearly show the formation and development of brine drainage channels. The sea-water freezing cell is 0.3 cm thick by 35 cm wide by 50 cm deep; the thermopane insulation permits the ice interior to be photographed. Experimental observation showed that vertical channels with diameters of 1 to 3 mm and associated smaller feeder channels extend throughout the ice sheet. Close examination of the brine channels show that their diameter at the icewater interface is much narrower than higher up in the ice, so that the channel has a 'neck' at the interface. Further, oscillations occur in the brine channels, in that brine flows out of the channel followed by a flow of sea-water up into the channel. Theoretically, a qualitative theory based on the difference in pressure head between the brine inside the ice and the sea-water provides a consistent explanation for the formation of the channels, and the onset of a

convective instability explains the existence of the neck. An analysis based on the presence of the brine-channel neck provides an explanation for the observed oscillations. An appendix contains an analysis of the thermal consequences of brine movement inside the ice. (Humphreys-ISWS)
W75-08408

STEAM, HOT-WATER AND ELECTRICAL THERMAL DRILLS FOR TEMPERATE GLACIERS,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
F. Gillet.
Journal of Glaciology, Vol 14, No 70, p 171-179, 1975. 6 fig, 18 ref.

Descriptors: *Glaciers, *Boreholes, *Drilling equipment, *Exploration, Glaciology, Temperate, Drilling, Steam, On-site investigations.
Identifiers: Hot-water drills, Electro-thermal drills.

The study of temperate glaciers has led to the development of three drilling processes. The steam drill used for ablation stakes is easily portable and its speed is 30-40 m/h for the first 10 m. A fairly large but irregular hole can be drilled to a depth of 100 m in less than 5 h with the hot-water drill. The electro-thermal drill, usable to great depths, is particularly suitable for rapid drilling (15 m/h and more) of small diameter holes (25 mm) with easily portable equipment. Design of the electro-thermal drill was described. (Humphreys-ISWS)
W75-08409

THE ORIGIN OF FOLIATION IN GLACIERS: EVIDENCE FROM SOME NORWEGIAN EXAMPLES,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Institut.
M. J. Hambrey.
Journal of Glaciology, Vol 14, No 70, p 181-185, 1975. 3 fig, 14 ref.

Descriptors: *Glaciers, Europe, *Stratification, Ice, Stratigraphy, On-site investigations, Geomorphology.
Identifiers: *Norway(Okstindan), *Foliation, Basal foliation.

Studies of Norwegian glaciers indicate that foliation is frequently derived from sedimentary stratification. Shearing and accompanying recrystallization of the ice is most likely to occur in the planes of the sedimentary layers, particularly where they are steeply dipping and have a longitudinal trend. Foliation not related to pre-existing layering is uncommon. Steeply dipping transverse layers, often referred to as foliation, are believed to be simply the traces of former crevasses. Studies of other glaciers are necessary to determine whether or not this is an isolated occurrence. (Humphreys-ISWS)
W75-08410

DROP STONES RESULTING FROM SNOW-AVALANCHE DEPOSITION ON LAKE ICE,
University of Western Ontario, London. Dept. of Geography.
B. H. Luckman.
Journal of Glaciology, Vol 14, No 70, p 186-188, 1975. 1 fig, 9 ref.

Descriptors: *Avalanches, *Geomorphology, *Lake ice, Snow, Lakes, Rocks, Ablation, *Canada, Erosion, Debris avalanches, Deposition(Sediments).
Identifiers: Scree, Lake Helen, Drop stones.

Dirty snow avalanches have been observed to carry considerable amounts of rock debris onto lake ice at the foot of scree slopes. As ice breaks up in the spring thaw, this material is carried back

and forth on ice floes and is gradually deposited in the lake. In some areas this produces typical drop stones of rock debris in predominantly fine-grained deposits. Most avalanche debris is very angular which enables avalanche drop stones to be differentiated from those of glacial or other drift-ice origins. However, where avalanches incorporate glacial debris, such deposits may be indistinguishable from those formed by floating glacier ice. (Humphreys-ISWS)
W75-08411

RADIO SOUNDINGS ON TRAPRIDGE GLACIER, YUKON TERRITORY, CANADA,
Department of the Environment, Calgary (Alberta). Inland Waters Directorate.
R. H. Goodman, G. K. C. Clarke, G. T. Jarvis, and S. G. Collins.
Journal of Glaciology, Vol 14, No 70, p 79-84, 1975. 4 fig, 2 tab, 10 ref.

Descriptors: *Glaciers, *Sounding, On-site investigations, Radar, Depth, Surveys, Measurement, Evaluation, Temperate, *Canada.
Identifiers: *Trapridge Glacier(Yukon Territory), Surge glaciers.

As part of a program to study surge-type glaciers, a radar-depth survey, using a frequency of 620 MHz, was made of Trapridge Glacier, Yukon Territory. Soundings were taken at 26 locations on the glacier surface and a maximum ice thickness of 143 m was measured. A rapid change in surface slope in the lower ablation region marks the boundary between active and stagnant ice and is suggestive of an 'ice dam' or the water 'collection zone' postulated by Robin and Weertman for surging glaciers. (Humphreys-ISWS)
W75-08412

EFFECT OF INVERSION WINDS ON TOPOGRAPHIC DETAIL AND MASS BALANCE ON INLAND ICE SHEETS,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies; and Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
I. M. Whillans.
Journal of Glaciology, Vol 14, No 70, p 85-90, 1975. 1 fig, 20 ref. NSF Grant GV-26137X.

Descriptors: *Glaciers, *Mathematical studies, *Snow, *Antarctic, Ice, Winds, Snowpacks, Topography, Slopes, Profiles, Surfaces, Analysis, Temperature.
Identifiers: Marie Byrd Land, Inversion winds, Accumulated snow, Mass balance.

Steady-state gravity flow of air (inversion wind) on sloping snow-covered ice sheets was analyzed for sensitivity to local topography. Topographic features of the order of a few kilometers or less in length are too small to affect the direction and speed of this air flow. Air flow on a longer scale should, however, conform closely to topography. Surface roughness on ice sheets is consistent with these results. Features of length shorter than a few kilometers (drifts and sastrugi) are transient, but longer features (surface undulations) remain essentially unaltered for many years. On the longer scale, inversion wind speed and therefore the amount of drifting and blowing snow should vary with the surface slope even where slope changes by as little as 0.1%. Observed variations in surface mass balance (accumulated snow) in upper Marie Byrd Land, Antarctica, support this hypothesis. Snow drift and inversion winds thus constitute a feed-back mechanism on the form of ice sheets and some of the topographic detail, formerly attributed to ice-flow character alone, may be in large part due to this mechanism. (Humphreys-ISWS)
W75-08413

WIND REGIMES AND HEAT EXCHANGE ON GLACIER DE SAINT-SORLIN,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
S. Martin.
Journal of Glaciology, Vol 14, No 70, p 91-105, 1975. 11 fig, 2 tab, 14 ref.

Descriptors: *Glaciers, *Winds, *On-site investigations, On-site data collections, Measurement, Evaluation, Analysis, Heat balance, Temperature, Velocity, Meteorological data, Humidity, Radiation, Snowmelt, Runoff, Ablation, Profiles.
Identifiers: *France(Glacier de Saint-Sorlin), Katabatic flow, Glacier wind.

During the summers of 1969 and 1970, data recorded in the ablation zone of the Glacier de Saint-Sorlin (Massif des Grandes Rousses, France) included temperature, air moisture, and wind profiles, as well as the radiation balance and the daily ablation. Numerous profiles characterize a katabatic flow following the line of greatest slope, and there appears to be a correlation between the speed of the 'glacier wind' and the corresponding temperature gradients. Computed according to Prandtl's theory of turbulent transfers, the flux of sensible and latent heat added to the radiation flux lead to theoretical values for the daily melting in good agreement with the measured values. The relative importance of the radiation balance on the melting of snow is 57%; that of the sensible heat flux is 43%; the latent heat flux is very weak and negative. (Humphreys-ISWS)
W75-08414

TEMPERATURE MEASUREMENTS IN A TEMPERATE GLACIER,
Washington Univ., Seattle. Geophysics Program.
W. D. Harrison.
Journal of Glaciology, Vol 14, No 70, p 23-30, 1975. 2 fig, 3 tab, 17 ref, 1 append. NSF Grants GU 2655, GA 28544.

Descriptors: *Glaciers, *Temperature, *On-site investigations, Ice, *Washington, Measurement, Instrumentation, On-site tests, Spatial distribution, Temperate, Thermometers.
Identifiers: *Blue Glacier(Wash), Thermistor.

Temperatures were measured at two sites in a temperate glacier (Blue Glacier, Washington) to depths of 192 and 76 m. The accuracy, which varies between about 0.002 and 0.005C, is about an order of magnitude better than previously obtained. Except near the surface, temperatures vary linearly with depth but are in disagreement with the simplest model of a temperate glacier, being about 0.02C colder near the surface and 0.04C colder at 192 m depth. (Humphreys-ISWS)
W75-08415

A MEASUREMENT OF SURFACE-PERPENDICULAR STRAIN-RATE IN A GLACIER,
Washington Univ., Seattle. Geophysics Program.
W. D. Harrison.
Journal of Glaciology, Vol 14, No 70, p 31-37, 1975. 2 fig, 1 tab, 9 ref. NSF Grants GU 2655, GA 28544.

Descriptors: *Glaciers, *Strain measurement, *On-site tests, *Theoretical analysis, On-site investigations, Strain, Rates, Velocity, Instrumentation, Measurement, Temperate, *Washington, Deformation, Ice.
Identifiers: *Blue Glacier(Wash), Surface-perpendicular components, Cables.

The surface-perpendicular components of velocity and strain-rate were determined at one site in the ablation area of Blue Glacier, Washington, where the total depth is about 250 m. The strain-rate is near zero at the surface but increases with depth to about 4% per year at 175 m. The results were obtained with the help of a finite deformation theory

from the measured stretch of 9 cables frozen into the ice. (Humphreys-ISWS)
W75-08416

RADIO ECHO SOUNDINGS AND ICE-TEMPERATURE MEASUREMENTS IN A SURGE-TYPE GLACIER,
British Columbia Univ., Vancouver. Dept. of Geophysics.
G. K. C. Clarke, and R. H. Goodman.
Journal of Glaciology, Vol 14, No 70, p 71-78, 1975. 6 fig, 12 ref.

Descriptors: *Glaciers, *Sounding, *On-site investigations, Radar, Ice, Temperature, Temperate, Measurement, Evaluation, Depth, *Canada, Surveys.
Identifiers: *Rusty Glacier(Yukon Territory), Basal ice, *Surge-type glaciers.

Radio echo soundings on Rusty Glacier, a small surge-type glacier in Yukon Territory, reveal that the ice is considerably thicker than previously believed. A reinterpretation of deep ice-temperature measurements made in 1969 and 1970 suggested that a large zone of temperate basal ice exists. This result supports thermal instability as the surge mechanism for Rusty Glacier. (Humphreys-ISWS)
W75-08417

INVESTIGATION OF POLAR SNOW USING SEISMIC VELOCITY GRADIENTS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics; and Wisconsin Univ., Middleton. Geophysical and Polar Research Center.
J. D. Robertson, and C. R. Bentley.
Journal of Glaciology, Vol 14, No 70, p 39-48, 1975. 2 fig, 3 tab, 14 ref. NSF Grants GV-27044, GV-32873.

Descriptors: *Snow, *Seismic waves, *Antarctic, *Glaciology, On-site investigations, Velocity, Seismic studies, Exploration, Polar regions, Ice, Depth, Temperature, Regression analysis.
Identifiers: *Velocity gradients, Snow accumulation.

Compressional wave velocity gradients at 43 of 50 Antarctic traverse stations plot as sequences of straight lines on semilogarithmic graph paper. Intersections of the lines appear to correlate with depths at which the predominant metamorphic mechanism in polar snow changes. The seismic pattern supports a three-layer interpretation of snow densification. The base of the upper layer (8.4 + or -2.3 m) corresponds to the 'critical depth' of Anderson and Benson (1963) at which snow grains settle into a 'random close-packed' arrangement. The base of the lower layer may correspond to the firn : ice transition depth, but more data are needed to confirm this conclusion. It is unclear what densification phenomenon is marked by the base of the middle layer (27.7 + or -4.4 m). The distinction between the middle and lower layers tends to disappear and the velocity gradient at a fixed depth increases as mean annual accumulation decreases. (Humphreys-ISWS)
W75-08418

RADIO ECHO SOUNDING ON TEMPERATE GLACIERS,
Water Management Service, Calgary (Alberta).
R. H. Goodman.
Journal of Glaciology, Vol 14, No 70, p 57-69, 1975. 14 fig, 1 tab, 21 ref.

Descriptors: *Glaciers, *Sounding, *Remote sensing, *On-site investigations, Glaciology, Ice, Depth, Instrumentation, Radar, Surveys, Temperate, Attenuation, *Canada, Data processing.
Identifiers: *Wapta Icefield, *Athabasca Glacier.

A high-resolution radio echo sounder operating at a frequency of 620 MHz was developed for studies of temperate glaciers. Excellent spatial resolution

was obtained through the use of a short pulse length (70 ns) and an antenna beam width of 5.2 degrees. Large amounts of high-quality data may be rapidly collected since the sounder incorporates an automatic positioning system and an on-line computer. Real time analysis of the echoes facilitates the understanding of complex reflecting horizons observed in temperate glaciers. Results obtained during field trials of the echo sounder on both the Wapta Icefield and Athabasca Glacier were given. The depth measurements obtained by radio echo soundings agreed with the seismic and borehole measurements of Savage and Paterson (1963) on Athabasca Glacier to within 14 m. Intraglacial structures which may be due to water levels within the ice were detected. Remote sensing of ice depths has applications to the analysis of gravity surveys in glaciated areas, to iceberg-scouring studies, and potentially to permafrost investigations. (Humphreys-ISWS)
W75-08419

DEDUCING THICKNESS CHANGES OF AN ICE SHEET FROM RADIO-ECHO AND OTHER MEASUREMENTS,
Bristol Univ. (England). H. H. Wills Physics Lab.
J. F. Nye.
Journal of Glaciology, Vol 14, No 70, p 49-56, 1975. 1 fig, 2 tab, 9 ref, 1 append.

Descriptors: *Glaciers, *Ice, *Model studies, *Analysis, Velocity, Depth, Glaciology, Measurement, Theoretical analysis, Evaluation, Radar, Arctic.
Identifiers: *Greenland(Jarl-Joset station), Ice sheet, Thickness, Accumulation rate.

The displacement of the surface of an ice sheet and of markers set in its top layers can be measured geodetically, and also, it is expected, by radio-echo methods. Discussed were how such measurements could be interpreted as showing long-term changes in the thickness of the ice sheet and how an experiment might be designed so as to avoid unwanted effects due to short-term changes in rate of accumulation. The analysis, similar to that of Federer and others (1970), corrects an error, so that when applied to their results for central Greenland it gives a different result for the lowering of the surface. Federer and others have already concluded that the average accumulation rates during the past 100 years have been below those needed to keep in balance with the velocity of the ice sheet as a whole. With the developed model, it was found that this has resulted in the surface lowering at a mean rate of 0.050 m/yr between 1871 and 1968, and a mean rate of 0.140 m/yr between 1959 and 1968. An analysis of the effect of thinning of the annual layers by lateral flow was given in an appendix. (Humphreys-ISWS)
W75-08420

THE STEADY DRIFT OF AN INCOMPRESSIBLE ARCTIC ICE COVER,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
D. A. Rothrock.
Journal of Geophysical Research, Vol 80, No 3, p 387-397, January 20, 1975. 9 fig, 1 tab, 32 ref. ONR Contract N00014-67-A-0103-0007, NSF Grant GV 28807.

Descriptors: *Ice cover, *Arctic, Movement, Model studies, Mathematical models, Arctic Ocean, Sea ice, Pressure, Velocity, *Compressibility, Mechanical properties.
Identifiers: Ridging, Vorticity.

The steady drift of pack ice in an idealized arctic basin was calculated by assuming that the ice is incompressible and inviscid. The momentum and continuity equations for the ice were solved for the velocity and the ice pressure. The divergence of velocity was assumed to be 0.33 x 10 to the minus 8th power/s. The boundary conditions required that no ice flows across coastal bounda-

ries but that ice flows out of the basin into the Greenland Sea and into the basin from the Kara Sea. The patterns of calculated velocities and vorticities were realistic, but their magnitudes were too high. The maximum calculated ice pressure of about 10 to the 8th power dyn/cm (pressure integrated through the ice thickness) was marginally able to ridge thick ice, according to the ridging model of Parmerter and Coon. These maximum values occur near Greenland, where Wittmann and Schule report intense ridging. When the wind stress was reduced to one third of the strength first assumed, realistic speeds and vorticities were obtained, and the maximum pressures were reduced to one third of the above value. Coastal shear zones of the order of 100 km wide can be represented by the added assumption of a shear viscosity of about 6 x 10 to the 12th power g/s and a no-slip condition on coastal boundaries. (Sims-ISWS)
W75-08423

OBSERVATIONS OF STAGE, DISCHARGE, PH, AND ELECTRICAL CONDUCTIVITY DURING PERIODS OF ICE FORMATION IN A SMALL SUBARCTIC STREAM,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp, R. E. Gilfilian, and C. S. Benson.
Water Resources Research, Vol 11, No 2, p 268-272, April 1975. 6 fig, 16 ref. NSF Grant GA-30748.

Descriptors: *Ice, *Streamflow, *Electrical conductance, Conductivity, Frazil ice, Freezing, Permafrost, Discharge(Water), Flow profiles, Discharge measurement, Water levels, Hydrogen ion concentration, *Subarctic, Streams, *Alaska.

Ice formation in a small subarctic stream modified the stage, velocity profiles, discharge, and electrical conductivity, while the pH remained nearly constant. Frazil ice crystals suspended in the flow reduced the velocity profiles and increased the stage. Anchor ice and border ice growth decreased the discharge by 31 and 55% for two periods of underwater ice production. These reductions in discharge may be attributed to storage in the form of ice and to upstream water storage caused by increased flow resistance in the stream. The increase in the electrical conductivity of the stream water during periods of ice production was related to the concentration of ice in the stream. Ice concentrations calculated from this increase in conductivity were 1.8, 0.9, and 4.7% (by volume) for the first 150 min of three different periods of ice production. (Sims-ISWS)
W75-08440

A THEORY FOR WATER FLOW THROUGH A LAYERED SNOWPACK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Water Resources Research, Vol 11, No 2, p 261-266, April 1975. 4 fig, 11 ref. DA 4A161102B52E.

Descriptors: *Snowpacks, *Flow, *Permeability, Ice, Snow, Flow rates, Fluid mechanics, Anisotropy, Stratification, Snowmelt, Slopes, Hydrology, Stratigraphy, Model studies, Cold regions.

A natural snowpack with ice layers was described in terms of an equivalent anisotropic porous medium. The anisotropic permeability was represented as a diagonalized matrix whose principal values can be calculated from a small amount of information about the prototype snowpack. Ice layers increase the transit time for water movement by a factor equal to the ratio of the principal values of permeability. The flow path, volume flux, and wave speed were determined by the slope of the snowpack and principal values of permeability. When a snowpack is assumed to be isotropic, the error in calculating transit time increases with the difference between the principal values of permeability. Uusual variations in slope introduce a small change in the transit time. (Sims-ISWS)

W75-08441

SOME CHARACTERISTICS OF THE ALBEDO OF SNOW,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
I. Dirmhirn, and F. D. Eaton.
Journal of Applied Meteorology, Vol 14, No 3, p 375-379, April 1975. 6 fig, 17 ref.

Descriptors: *Albedo, *Snow cover, *Remote sensing, Radiation, Solar radiation, Reflectance, Optical properties, Satellites(Artificial), Instrumentation, Anisotropy.
Identifiers: Snow cover metamorphism, Radiometers, Pyranometers, Specular reflectance, Diffuse reflectance.

Spring snowcovers exhibit a substantial contribution of a specular component to their reflection of solar radiation. This anisotropy can be measured with radiometers with small aperture, such as a TIROS radiometer. Indicatrices thus determined are dependent on solar angle. They are of importance for interpreting albedo values and for reducing airborne or spaceborne reflectance data taken under distinct nadir angles. (Sims-ISWS)
W75-08452

SALVAGE OF HEAVY CONSTRUCTION EQUIPMENT BY A FLOATING ICE BRIDGE,
Foundation of Canada Engineering Corp. Ltd., Calgary (Alberta). Arctic Div.
For primary bibliographic entry see Field 8G.
W75-08461

A FIRST SIMPLE MODEL FOR PERIODICALLY SELF-SURGING GLACIERS,
Department of Science, Melbourne (Australia). Antarctic Div.
W. F. Budd.
Journal of Glaciology, Vol 14, No 70, p 3-21, 1975. 7 fig, 2 tab, 36 ref.

Descriptors: *Model studies, *Glaciers, *Movement, Mathematical models, Ice, Glaciology, Ablation, Flow rates, Velocity, Flow characteristics, Frequency.
Identifiers: Self-surging glaciers, Two-dimensional model, *Glacier advance, Glacier retreat.

A two-dimensional model of glacier flow was presented which includes periodical surging as a natural phenomenon for a certain class of glaciers. The input consists of the bedrock and balance profiles along the glacier, ice flow properties and a frictional lubrication factor. The basal stress is determined from the condition of gross equilibrium for the whole glacier and the distribution of the frictional lubrication from energy dissipation along the glacier. The difference between the basal stress and the down-slope stress of the glaciers produces longitudinal strain-rates which determine the basal sliding velocity. Since the velocity is also involved in the frictional lubrication, feedback develops between the basal stress and sliding velocity. For a given lubrication factor, a critical stage can be reached for which the velocity becomes sufficiently high to lower the basal stress enough to cause high velocities to develop. The model gives rise to three classes of glaciers with two modes of flow. 'Ordinary' glaciers do not have sufficient mass flux, for the given bedrock profile, to go beyond the 'slow mode' in which the basal stress and velocity increase together as the glacier builds up to steady state. 'Fast' glaciers have sufficient flux to remain continuously in the 'fast mode' with high velocities and relatively low basal stress. 'Surging' glaciers have sufficient flux to reach the fast mode but not to maintain it, and thus develop a periodically oscillating state between the fast and slow modes with gradual build up and rapid drainage. Results were presented for models of a typical large valey surging glacier and for a very high-speed surging glacier. (Humphreys-ISWS)

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W75-08713

METHOD FOR CONSTRUCTING ICE ISLANDS IN COLD REGIONS,
Union Oil Co. of California, Los Angeles. (assignee)
For primary bibliographic entry see Field 8C.
W75-08734

RESERVOIR OPERATION USING SNOW SURVEY DATA,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 4A.
W75-08809

2D. Evaporation and Transpiration

CONCERNING THE EFFECT OF ANISOTROPIC SCATTERING AND FINITE DEPTH OF THE DISTRIBUTION OF SOLAR RADIATION IN SNOW,
High Altitude Observatory, Boulder, Colo.
For primary bibliographic entry see Field 2C.
W75-08405

WIND REGIMES AND HEAT EXCHANGE ON GLACIER DE SAINT-SORLIN,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W75-08414

RESPONSE OF AN UNSATURATED SOIL TO FOREST TRANSFIRATION,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange, and D. E. Aylor.
Water Resources Research, Vol 11, No 2, p 319-323, April 1975. 3 fig, 12 ref, 1 append.

Descriptors: *Transpiration, *Discharge(Water), *Forest watersheds, Evaporation, Diurnal, Saturated soils, Soil water, Soil moisture, Hydrologic aspects, Water consumption, Seepage, Deep percolation, Cycles, Gravimetric analysis, Connecticut, Forests, Moisture content, Movement, *Connecticut.
Identifiers: Sandy loam.

Diurnal cycles in water outflow from a small watershed due to forest transpiration were observed 4 times during August 1973. Each time the daytime outflow was reduced significantly below that during the following night. The recovery of the outflow to the steady night level took place for several hours after sunset, and this time of recovery was shown to be controlled by the unsaturated soil water movement in the root zone. The observations of transpiration were made on a small area of a 5-acre forested watershed in North Madison, Connecticut, surrounding a lake. Water seeped from the lake into the observation plot and emerged on the other side where it passed through a weir and was monitored continuously. The difference between the amount of water seeping into the test plot from the lake and the measured outflow determined the evapotranspiration from the plot. (Roberts-ISWS)
W75-08436

PERSISTENCE OF SELECTED ANTITRANSPIRANTS,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
F. Kreith, A. Taori, and J. E. Anderson.
Water Resources Research, Vol 11, No 2, p 281-286, April 1975. 5 fig, 15 ref. NSF Grant GK-17184.

Descriptors: *Antitranspirants, *Persistence, *Tobacco, Water vapor, Phenols, Sprays, Leaves,

Water loss, Transpiration, Transpiration control, Analytical techniques, Ecology, Laboratory tests.
Identifiers: *Experimental conditions, Phenylmercuric acetate, Wilt Pruf, Monoglycerol ester, Mobileaf, Metabolic agents, Wind tunnel.

The short- and long-term effectiveness of two film-forming and two physiologically active antitranspirants was evaluated on tobacco leaves under controlled experimental conditions. The physiologically active antitranspirants (phenylmercuric acetate and monoglycerol ester of n-decenyl succinic acid) initially reduced water loss to less than 40% of controls, but their effectiveness diminished sharply within 2-3 days. Treatment with the film-forming antitranspirants (Wilt Pruf and Mobileaf) resulted in initial transpiration reductions to 50-65% of controls, but the duration of effectiveness was longer with these than with the metabolic agents. The results were compared with those of previous studies, and implications for large-scale antitranspirant applications were discussed. Since the cost of water varied considerably in different parts of the world, the economic viability of using antitranspirants could not be ascertained by a technical study alone. Under conditions for which water is expensive or not available, the use of antitranspirants may be economical provided no adverse ecological effects occur. (Roberts-ISWS)
W75-08439

THE EVAPORATION OF INTERCEPTED RAINFALL FROM A FOREST STAND: AN ANALYSIS BY SIMULATION,
Duke Univ., Durham, N.C. School of Forestry.
C. E. Murphy, Jr., and K. R. Knoerr.
Water Resources Research, Vol 11, No 2, p 273-280, April 1975. 8 fig, 1 tab, 36 ref. NSF AG-199, BMS69-01147-A09.

Descriptors: *Evaporation, *Evapotranspiration, *Rainfall, *Forests, Interception, Canopy, Rain, Simulation analysis, Energy transfer, Radiation, Hydrologic cycle, Latent heat, Absorption, Vegetation, Atmosphere.
Identifiers: *Forest stand, Sensible heat.

Both evapotranspiration and the evaporation of intercepted precipitation are evaporative losses. They generally have been expressed as separate terms in the hydrologic cycle because they were believed to be independent of each other. A model was described of the energy exchange between the atmosphere and a vegetated surface which was developed and used to investigate the sources of energy available for evaporation of precipitation intercepted by a forest canopy. Simulations of this model demonstrated that a forest canopy wetted by rainfall partitions more of the absorbed radiant energy into latent heat exchange than an unwetted canopy in the same environment. This energy diversion creates a decrease in sensible heat transfer from the canopy to the atmosphere and a smaller decrease in a long-wave radiation emitted by the canopy. From this analysis, it was clear that precipitation intercepted by vegetation evaporated at a greater rate than transpiration from the same type of vegetation in the same environment. The model demonstrated that the enhanced evaporation of intercepted water can occur for forests of large areal extent, where horizontal advection may be negligible. (Roberts-ISWS)
W75-08442

PARAMETERIZATION OF SURFACE MOISTURE AND EVAPORATION RATE IN A PLANETARY BOUNDARY LAYER MODEL,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
C. J. Nappo, Jr.
Journal of Applied Meteorology, Vol 14, No 3, p 289-296, April 1975. 7 fig, 1 tab, 20 ref.

Descriptors: *Model studies, *Evaporation, *Moisture, Meteorology, Mathematical models, Air-earth interfaces, Soils, Soil moisture, Boundary layers, Boundary processes, Soil surfaces, Soil types, Temperature, Water vapor.

Two methods of parameterizing expressions for ground surface evaporation rate that are used in planetary boundary layer models were examined. In one method (Method A) the surface evaporation rate is proportional to $M(Q \text{ sub } s - Q \text{ sub } 1)$. In the other (Method B) the surface evaporation rate is proportional to $hQ \text{ sub } s - Q \text{ sub } 1$. Here $Q \text{ sub } s$ is the surface saturation mixing ratio, $Q \text{ sub } 1$ the mixing ratio at the lowest level of the atmospheric model, M the moisture availability parameter, and h the relative humidity immediately above the ground. The analysis was performed by running a planetary boundary layer numerical model several times, using at each time either Method A or B with different specifications of M and h. The calculated diurnal surface temperature and surface latent heat flux were examined. Specific results were: (1) for equal M and h, Method B results in higher surface temperatures than Method A; (2) the surface evaporation rate calculated using Method A is less sensitive to changes in M, than the surface evaporation rate calculated using Method B is to changes in h; (3) negative surface evaporation rates can occur much more easily using Method B than Method A; and (4) calculation of h by calculating the flux of moisture below the ground surface does not improve the model. (Sims-ISWS)
W75-08451

SPRINKLER AND SOAKER IRRIGATION OF PEACH TREES TO REDUCE PLANT WATER STRESS AND INCREASE FRUIT SIZE,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 3F.
W75-08596

SIMULATION MODEL FOR EVAPOTRANSPIRATION OF WHEAT: EMPIRICAL APPROACH,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
D. Shimshi, D. Yaron, E. Bresler, M. Weisbrod, and G. Strateener.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR1, Proceedings Paper 11170, p 1-12, March 1975. 2 fig, 4 tab, 16 ref, 2 append.

Descriptors: *Evapotranspiration, *Wheat, *Simulation analysis, Agriculture, *Soil water, Root zone, Irrigation, Rain water, Arid lands, Infiltration, Soil surfaces, Wetting, Field capacity, Water loss, Root systems, Soil profiles, Canopy, Evaporation, *Model studies.
Identifiers: *Israel(Neveg).

A simulation model was described for predicting the changes in the soil-water content of the root zone of wheat growing under various irrigation regimes in a semi-arid region. The model was based on the following assumptions: (1) irrigation water and rainwater infiltrates from the soil surface, wetting each successive soil layer as the overlying one is wetted in excess of the field capacity (as conventionally defined); and (2) the rate of water loss from the soil changes with time and with depth of soil. Parameters were determined empirically from soil moisture data collected from a series of wheat irrigation experiments carried out over a 4-year period in northern Negev, Israel. The average relative deviation between computed and observed values of soil moisture ranged from 8.8 to 13.5%. The changes in parameters reflected the development of the root system in the soil profile and the changes in time of canopy cover and evaporation conditions. (Roberts-ISWS)
W75-08712

2E. S[...]

**THE [...]
STREA[...]
ON WO[...]**
L. G. W[...]
Freshw[...]
Illus.

Descripti[...]
Identifi[...]

Regular[...] stony [...] spores [...] were p[...] ever, t[...] Heliscu[...] garitisp[...] cured t[...] Alatosp[...] Articula[...] and Cla[...] dry per[...] not fou[...] wood v[...] returned[...] examina[...] longed o[...] the 9 c[...] above, [...] involve[...] trospori[...] had not[...] twigs. [...] was an o[...] ing the [...] and thi[...] release [...] tion, fro[...] a late [...] colonizi[...] Dictyos[...] In this [...] close to[...] particul[...] tion. A[...] main sa[...] sp., Cu[...] spp. and[...] nisaci v[...] used. A[...] 2 of the[...] never o[...] sarina s[...] guillosp[...] within 2[...] Ceratos[...] -Copyri[...]
W75-08[...]

**ANALY[...]
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For prin[...]
W75-084[...]

**REGION[...]
DROUG[...]**
Colorad[...]
Enginee[...]
For prin[...]
W75-084[...]

2E. Streamflow and Runoff

THE FUNGAL SPORA OF A FRESHWATER STREAM AND ITS COLONIZATION PATTERN ON WOOD,
L. G. Willoughby, and J. F. Archer.
Freshwater Biol, Vol 3, No 3, p 219-239, 1973. Illus.

Descriptors: Fungi, Streams, *Aquatic fungi.
Identifiers: *Hyphomycete.

Regular samplings of foam from Smooth Beck, a stony stream with soft water, showed that more spores and more species of aquatic hyphomycetes were present during wet than dry periods. However, the spores of 4 aquatic hypomycetes, Heliscus lugdunensis, Lemonniera aquatica, Margaritispora aquatica and Tricladium splendens occured throughout the year and those of 5 others, Alatospora acuminata, Anguillospora longissima, Articulospora tetracladia, Clavariopsis aquatica and Clavatospora stellata were also present during dry periods. Spores of Dendrospora erecta were not found in the summer months. Pre-sterilized wood was exposed for colonization and then returned to the laboratory and examined. Further examinations took place during subsequent prolonged damp incubation of the twig collections. Of the 9 common aquatic hyphomycetes mentioned above, only C. stellata and M. aquatica were not involved in the colonization. Two species, Centrospora acerina and Dactylella aquatica, which had not released spores into the foam grew on the twigs. H. lugdunensis, together with Fusarium spp. was an early colonist, showing its best growth during the first 4 mo. It was still present after 12 mo., and this presistence may be related to a slow release of sugars, determined by anthrone estimation, from the twigs. Dimorphospora foliicola was a late colonist. Dematiaceous hyphomycetes colonizing the twigs included Brachysporium sp., Dictyosporium toruloides and Helicomyces spp. In this category also unidientified sp. 4, possibly close to Phaeotrichoconis Salam and Rao, was a particularly frequent find following damp incubation. Ascomycetes to colonize the twigs in the main sampling period comprised Ceratostomella sp., Cudoniella clavus, Massarina sp., Mollisia spp. and Nectria lugdunensis. Apostemidium guernisaci was obtained when unsterilized twigs were used. Any 1 twig could only support the growth of 2 of these different ascomycetes. Ceratostomella never occurred in association with Mollisia. Massarina sp. cultures yielded conidiospores of Anguillospora longissima. Massarina sp. could fruit within 2 mo. of initial exposure of the twig while Ceratostomella sp. required at least 7 mo. to fruit.-
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W75-08374

ANALYSIS OF RESISTANCE OVER STAGGERED ROUGHNESS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08394

APPLICATIONS OF HYDROLOGY TO WATER RESOURCES MANAGEMENT (PLANNING AND DESIGN LEVEL),
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 6B.
W75-08400

REGIONAL WATER EXCHANGE FOR DROUGHT ALLEVIATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08403

ACOUSTIC MINIPROBING FOR OCEAN MICROSTRUCTURE AND BUBBLES,
Naval Postgraduate School, Monterey, Calif. Dept. of Physics and Chemistry.
For primary bibliographic entry see Field 2L.
W75-08425

MAXIMUM HEIGHTS OF OCEAN WAVES,
MPR Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 2L.
W75-08426

THE BERING SLOPE CURRENT SYSTEM,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W75-08431

SOME COMMENTS ON TESTING RANDOM TOPOLOGY STREAM NETWORK MODELS,
State Univ. of New York, Buffalo. Dept. of Geography.
R. S. Jarvis, and A. Werritty.
Water Resources Research, Vol 11, No 2, p 309-318, April 1975. 6 fig, 3 tab, 16 ref.

Descriptors: *Channel morphology, *Distribution patterns, *Statistical methods, Analytical techniques, *Model studies, Drainage, Data collections, Probability, Algorithms, Tributaries, Geomorphology, Streams.
Identifiers: *Stream network models, *Random topology, Stream-ordering systems, Bifurcation ratios, Morphometry.

Various methods of classifying stream networks were examined in terms of their attendant information losses. Grouping networks according to their mean source height scored well in this respect because it retains a considerable amount of the original topologic detail present in each individual topologically distinct channel network. Stream set values determine the structural properties of the network and the degree to which a given network is 'compact' or 'lineated.' Because of difficulties in interpretation, tests of random topology hypotheses are best conducted on networks sampled at a constant magnitude. A means of comparing the topologic structure of the main stem of two or more networks was developed, based on the absolute limits and the expectation of the parameter mean source height. (Singh-ISWS)
W75-08437

PROPERTIES OF THE THREE-PARAMETER LOG NORMAL PROBABILITY DISTRIBUTION,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges, D. P. Lettenmaier, and C. L. Bates.
Water Resources Research, Vol 11, No 2, p 229-235, April 1975. 4 fig, 3 tab, 8 ref.

Descriptors: *Statistical models, *Synthetic hydrology, *Analytical techniques, *Frequency analysis, *Reliability, Mathematics, Estimating, Monte Carlo method, Variability, Hydrology.
Identifiers: *Three-parameter lognormal distribution, Skew coefficient.

Mathematical properties of the three-parameter log normal probability distribution were detailed. Two methods for estimation of the third parameter a were compared. The estimator of a using sample mean, median, and standard deviation was found to be more variable and to have larger bias for distributions of interest in operational hydrology than the estimator using sample mean, standard deviation, and skew. Graphical solutions for the third parameter a were presented; a single feasible value of a was shown to result when the skew estimator was used; two feasible solutions result when the median estimator was used. The smaller of the two solutions was shown to correspond to skews of

less than 5.87 and hence is the desired solution in most hydrologic applications. (Singh-ISWS)
W75-08438

OBSERVATIONS OF STAGE, DISCHARGE, PH, AND ELECTRICAL CONDUCTIVITY DURING PERIODS OF ICE FORMATION IN A SMALL SUBARCTIC STREAM,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W75-08440

A THEORY FOR WATER FLOW THROUGH A LAYERED SNOWPACK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W75-08441

WELSH FLOODPLAIN STUDIES: THE NATURE OF FLOODPLAIN GEOMETRY,
University Coll. of Wales, Aberystwyth.
J. Lewin, and M. M. M. Manton.
Journal of Hydrology, Vol 25, No 1/2, p 37-50, April 1975. 6 fig, 1 tab, 16 ref.

Descriptors: *Flood plains, *Braiding, *On-site investigations, Meanders, Geomorphology, Surveys, Evaluation, Channel morphology, Flood profiles, Discharge measurement, Aggradation, Photogrammetry, Topography, Terrain analysis.
Identifiers: *Floodplain geometry, Wales.

Field studies of floodplain geometry are necessary if the extent and patterns of inundation are to be related to discharge magnitudes. This was considered in relation to the floodplain geometry of parts of the three Welsh rivers--the Ystwyth, the Rheidol, and the Tywi. A photogrammetric approach was used and tested, together with the development of computer procedures for automated plotting of floodplain profiles on any required scale. The complex and locally variable relief (1.7 to 3.3 m) of the floodplains studied was shown to be related to former braided and meandering river activity, some of it within the past 130 years for which reasonable historical evidence is forthcoming. Relief results dominantly from the presence of abandoned channel loops, from point bars, and from former channel bedforms now incorporated into the floodplain surface. Local aggradation and incision are also evident. Variation along the rivers is such that a single discharge-related flood-stage is not identifiable; instead there are sequences of flooding and emptying beginning at relatively low discharges and related to floodplain relief. Some consequences for flood studies and floodplain management were suggested. (Dawes-ISWS)
W75-08448

ESTIMATING STREAMFLOW CHARACTERISTICS FOR STREAMS IN UTAH USING SELECTED CHANNEL-GEOMETRY PARAMETERS,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4A.
W75-08494

EMPIRICAL DATA ON LONGITUDINAL DISPERSION IN RIVERS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W75-08495

POTENTIAL FLOOD HAZARD--NORTH AVENUE AREA, DENVER FEDERAL CENTER, LAKEWOOD, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4A.
W75-08496

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS-OKLAHOMA, 1972: 1974 WATER YEAR,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W75-08497

FLOOD ON BUFFALO CREEK FROM SAUNDERS TO MAN, WEST VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08508

RECONNAISSANCE OF THE UPPER AU SABLE RIVER, A COLD-WATER RIVER IN THE NORTH-CENTRAL PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08512

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1974,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W75-08516

MAGNITUDE AND FREQUENCY OF FLOODS IN WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4A.
W75-08520

DESIGN AND IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL, 1971-74,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08523

A COMPUTATIONAL MODEL FOR PREDICTING THE THERMAL REGIMES OF RIVERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-08683

DETERMINATION OF URBAN WATERSHED RESPONSE TIME,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-08685

NORMAL MODES OF THE ATLANTIC AND INDIAN OCEANS,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2L.
W75-08686

TIDAL CHARTS OF THE CENTRAL PACIFIC OCEAN,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2L.
W75-08687

SOME PROPERTIES OF THE WARM EDDIES GENERATED IN THE CONFLUENCE ZONE OF THE KUROSHIO AND OYASHIO CURRENTS,
Hokkaido Regional Fisheries Research Lab., Yoichi (Japan).
For primary bibliographic entry see Field 2L.
W75-08688

MICROSTRUCTURE AND INTRUSIONS IN THE CALIFORNIA CURRENT,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W75-08689

INTERNAL WAVE REFLECTION BY A VELOCITY SHEAR AND DENSITY ANOMALY,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
R. P. Mied, and J. P. Dugan.
Journal of Physical Oceanography, Vol 5, No 2, p 279-287, April 1975. 5 fig, 1 tab, 29 ref.

Descriptors: *Internal waves, *Reflectance, *Shear, *Density, Thermocline, Velocity, Waves(Water), Energy, Oceans, Ocean waves, Oceanography, Numerical analysis.

Numerical solutions were obtained for the reflection of upward propagating internal waves by simple pycnocline and current shear models. Results for a simple monotonic shear and a velocity jet, with and without a pycnocline, led to the conclusions that: (1) significant portions of an internal wave spectrum generated in the deep ocean can be reflected back downward by changing Brunt-Vaisala frequency and shear, even in situations not involving critical layers; (2) reflections by shear usually reinforce those from density variations; and (3) under some propagation conditions, a portion of the wave energy is leaked through the velocity jet, even when the fluid within the jet will not support wave motion of the impinging frequency. (Sims-ISWS)
W75-08690

A NUMERICAL STUDY OF TIME-DEPENDENT TURBULENT EKMAN LAYERS OVER HORIZONTAL AND SLOPING BOTTOMS,
Florida State Univ., Tallahassee. Dept. of Oceanography, and Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.
G. L. Weatherly.
Journal of Physical Oceanography, Vol 5, No 2, p 288-299, April 1975. 11 fig, 17 ref. ONR Contract N000-14-75-C-201.

Descriptors: *Oceans, *Turbulent boundary layers, *Numerical analysis, Profiles, Velocity, Model studies, Time, Tides, Ocean currents, Currents(Water), Oceanography, Florida.
Identifiers: *Ekman layers, Logarithmic layers, Time-dependence, *Straits of Florida.

A numerical study was made of a time-dependent turbulent Ekman bottom boundary layer. Parameters for the model were chosen to simulate conditions near the bottom of the Florida Current in the Straits of Florida. The model allows the coefficient of turbulent viscosity v to vary with time t and height z and permits the effects of an imposed stable stratification and sloping bottom to be included. The variation of v with t and z was not present but was determined in the course of solving the problem. The results of this preliminary study were compared to the author's observations. The agreement was good for the friction velocity values as well as for the mean total Ekman veering. However, most of the computed Ekman veering occurred above the logarithmic layer while most of the measured veering occurred within the logarithmic layer. The results suggest, as do the observations, that turbulent Ekman bottom layers varying on time scales of order the local inertial period are not quasi-stationary. Allowing the bottom to be inclined at a small angle transverse to the flow was found to modify significantly the temperature profile near the bottom, leading at times either to the formation of a homogeneous layer of depth order 10 m or to conditions marginally suitable for the formation of convectively mixed layer of comparable depth. (Sims-ISWS)
W75-08691

COASTAL TRAPPED WAVES IN A BAROCLINIC OCEAN,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W75-08692

THE INFLUENCE OF LONGITUDINAL VARIATIONS IN WIND STRESS CURL ON THE STEADY OCEAN CIRCULATION,
Scripps Institution of Oceanography, La Jolla, Calif.
K. E. Kenyon.
Journal of Physical Oceanography, Vol 5, No 2, p 334-346, April 1975. 11 fig, 20 ref.

Descriptors: *Ocean circulation, *Winds, *Model studies, Mathematical models, Oceans, Temperature, Wind pressure, *Pacific Ocean, Oceanography.
Identifiers: *Wind stress curl, Longitudinal variations, Mean ocean temperatures.

The influence of longitudinal variations in wind stress curl on the steady circulation in a rectangular ocean basin was investigated analytically in a linear barotropic model. It was shown that longitudinal variations in the interior circulation are produced by longitudinal variations in the magnitude of a wind stress curl of constant (negative) sign. If friction is small in the interior, the east-west variation in southward flow is directly proportional to that of the applied wind stress curl in accordance with the Sverdrup vorticity balance. Examples showed that when the wind stress curl has a maximum in the center of the basin, the southward flow is also concentrated in the center of the basin. When the wind stress curl has a minimum in the center of the basin, the soutward flow is concentrated in two regions, one on either side of the minimum curl. This variation in southward flow causes a concentration in east-west flow along the northern and southern boundaries of the basin, which is not obvious from the Sverdrup balance. If the minimum value of the wind stress curl term is smaller than the friction term in the vorticity equation, there is northward flow in the center of the basin which is part of a closed anticyclonic gyre in the eastern half of the basin. Longitudinal variations in wind stress curl can also produce differences in the northward flow in the western boundary current compared to the case of a wind stress curl which is independent of longitude. The longitudinal distribution in mean sea surface temperature was consistent with the circulation in the dynamical model which is produced by a qualitatively realistic longitudinal variation in mean wind stress curl. (Sims-ISWS)
W75-08693

DYNAMIC HEIGHT FROM TEMPERATURE PROFILES,
Hawaii Univ., Honolulu. Dept. of Oceanography.
W. J. Emery.
Journal of Physical Oceanography, Vol 5, No 2, p 369-375, April 1975. 6 fig, 1 tab, 11 ref.

Descriptors: *Temperature, *Salinity, *Oceans, Sounding, Hydrography, Curves, *Pacific Ocean, Water temperature, Oceanography, On-site investigations.
Identifiers: *Dynamic height, Temperature-salinity relationships, Weatherships, Inversions.

A method was developed for the computation of dynamic height from temperature data alone by using a mean temperature-salinity relationship to provide salinity values. This method was tested at three Pacific weathership locations where a large number of hydrographic stations were available. At weatherships Victor (34N, 164E) and November (30N, 140W), the difference between dynamic height found by this method and dynamic height computer from temperature and salinity observations was smaller (0.2 sq m/sq s) than either the theoretical measurement error (0.4 sq m/sq s)

or observed variation in dynamic height. At location Papa (50N, 145W), however, the difference was greater than the uncertainties in dynamic height, due to a thermal inversion. The small difference at Victor and November means that when the temperature-salinity relationship is 'tight', as it is at these locations, dynamic height can be computed from temperature data along. (Sims-ISWS)
W75-08696

DYNAMIC BEHAVIOR MODEL OF EPHEMERAL STREAM,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
K. G. Renard, and E. M. Laursen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY5, Proceedings Paper 11315, p 511-528, May 1975. 16 fig, 15 ref, append.

Descriptors: *Mathematical models, *Sedimentation, *Erosion, *Rainfall-runoff relationships, Sediment transport, Surface runoff, Hydrology, Ephemeral streams, Analytical techniques, Open channel flow, Sediments, Hydraulics, Hydrology, Sediment load, Stream erosion, Peak discharge, River beds, River flow, Geomorphology, Storm runoff, Model studies, Watersheds(Basins), Demonstration watersheds, *Arizona.
Identifiers: Runoff-sediment relationships, *Walnut Gulch Experimental Watershed(Ariz).

Ephemeral stream hydraulic features are dynamic and respond to the variable streamflow available to move sediment. Streamflow varies both from the runoff-producing storms and transmission losses that decrease the runoff volume and peak. The channel profile in an ephemeral stream tends to be concave up because of the transmission losses and concave down because there is more flow downstream due to tributary inflow. These phenomena were modeled for the main channel of the Walnut Gulch Experimental Watershed using a geomorphic approach to describe the channel and its tributaries and a hydraulic-hydrologic model for the runoff-sediment movement. Runoff and sediment transport were synthesized using the Diskin-Lane stochastic runoff model with a deterministic sediment transport relationship using the Manning and Laursen equations. (Lee-ISWS)
W75-08699

NONEQUILIBRIUM RIVER FORM,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-08700

A TWO LAYER FLOW THROUGH A CONTRACTION,
New South Wales Univ., Kensington (Australia).
Water Research Lab.
For primary bibliographic entry see Field 8B.
W75-08701

CIRCULATION IN CENTRAL LONG ISLAND SOUND,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W75-08702

PROPAGATION OF TIDAL WAVES IN THE JOSEPH BONAPARTE GULF,
Wollongong Univ., Coll. (Australia). Dept. of Mathematics.
For primary bibliographic entry see Field 2L.
W75-08706

THE EFFECT OF ROUGHNESS STRIPS OF TRANSVERSE MIXING IN HYDRAULIC MODELS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08708

THE DETERMINATION OF CURRENT VELOCITIES FROM DIFFUSION/ADVECTION PROCESSES IN THE IRISH SEA,
University Coll. of North Wales, Bangor. Dept. of Physical Oceanography.
J. R. Hunter.
Estuarine and Coastal Marine Science, Vol 3, No 1, p 43-55, January 1975. 3 fig, 15 ref.

Descriptors: *Water circulation, *Oceans, *Currents(Water), *Model studies, Mathematical models, Velocity, Tidal waters, Tidal streams, Distribution patterns, Diffusion, Flow, Advection, Movement, Salinity.
Identifiers: *Irish Sea.

The validity of estimations of current velocity from the distribution of a property subject to diffusion and advection was discussed. The observed salinity distribution in the Irish Sea, observed values of the diffusion coefficient, and the results of a tidal numerical model were used to investigate the water circulation pattern. The results showed a residual Northward transport through the center of the Irish Sea, with southward flowing transports to the east and west of the main stream. It was shown that a numerical model of the diffusion/advection processes together with a knowledge of the salinity, diffusivity coefficients, precipitation, and evaporation can yield useful information concerning the vertically-integrated velocity field. The input data was not of sufficient quality to calculate the actual vector field, but only one component of the required vector. *Humphreys-ISWS)
W75-08717

ANALYSIS OF FLOW IN CHANNELS WITH GRAVEL BEDS,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08793

DISCHARGE, SLOPE, BED ELEMENT RELATIONS IN STREAMS,
Sargent and Lundy, Chicago, Ill.
J. K. Virmani, D. F. Peterson, and G. Z. Watters.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 73-84, 1973. 3 fig, 5 tab, 10 ref, 1 append. USDA Grant 12-11-204-3.

Descriptors: *Discharge(Water), *Slopes, *Beds, Drainage area, Discharge frequency, Streamflow, Hydraulics, Roughness(Hydraulic), Flow, Channel flow, Flood frequency, Channel erosion, Rocks, Gravels, On-site investigations, Mathematical models.
Identifiers: Bed materials, Bear River Basin.

Throughout the world in mountainous and hilly terrain, flow occurs in both natural and man-made channels with large slopes. In many of these streams, the beds are composed of large elements where the ratio of depth to average bed element size is less than 30. The hydraulic roughness and size distribution of bed elements and the random behavior of the spatial distribution of these elements have not been studied in sufficient depth. A better understanding of the formation of these streams, the size distribution of their roughness elements, and their hydraulic behavior could lead to useful practical applications in predicting stream erosion and the effects of alterations of

natural conditions caused by road construction, dam construction, etc. With these objectives in mind extensive data were collected in the Bear River Basin in Utah, Idaho, and Wyoming on discharges, drainage areas, channel slopes, channel cross-section shapes, and bed material size distribution. Hydraulic geometry equations were used and the power relationships of width, depth, velocity, and area to discharge were established. The relationship between discharge, drainage area, and frequency of occurrence of discharges was found. A method for relating slope, bed roughness, size, and discharge was presented which is based on the distribution of stream power. An example was presented which illustrates the application of the work to a typical engineering situation. (See also W75-08786) (Sims-ISWS)
W75-08794

FLOOD PLAIN MANAGEMENT IN MONTANA,
Montana Dept. of Natural Resources and Conservation, Helena. Floodway Management Bureau.
For primary bibliographic entry see Field 6F.
W75-08795

WINTER STORM AND FLOOD ANALYSES, NORTHWEST INTERIOR,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
C. W. Johnson, and R. P. McArthur.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 359-369, 1973. 7 fig, 4 tab, 6 ref, 1 append.

Descriptors: *Floods, *Winter, *Mountains, *Runoff, Watersheds(Basins), Precipitation(Atmospheric), Snowfall, Snowmelt, Instrumentation, Precipitation gages, Winds, Temperature, Frozen soils, Storm runoff, Flood frequency, Peak discharge, On-site investigations, Hydrology, Meteorology, *Idaho, Demonstration watersheds.
Identifiers: *Reynolds Creek(Ida).

In the Northwestern United States, severe winter floods occur frequently and have produced the greatest peak discharges of record at many runoff stations. Winter flooding has been reported at some locations in southern Idaho about once in 2 years, and two or more events have been reported during some years. The Reynolds Creek Experimental Watershed in southwest Idaho was chosen for a detailed investigation of winter floods. This watershed represents a variety of rangeland conditions in Idaho, Nevada, and Oregon. A network of nearly 100 recording raingages have been maintained on and adjacent to the watershed since 1961. Temperature, humidity, and wind direction and velocity were recorded at three climatological stations. Snow depth and density measurements were made twice each month at eight snow courses. Additional snow measurements were made regularly at raingage locations when snow was on the ground. The depths of frost penetration and thawing were measured and noted regularly at raingage sites. Continuous records of runoff were obtained from a network of 13 weirs. Results of a runoff evaluation procedure show the extreme variability in watershed areas that contribute to winter storm runoff and indicate that large errors are associated with the common assumption that all areas of a watershed contribute equally. (See also W75-08786) (Sims-ISWS)
W75-08818

CALIBRATION OF WATERSHED WETNESS AND PREDICTION OF FLOOD VOLUME FROM SMALL WATERSHEDS IN HUMID REGION,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 2A.

W75-08819

PREDICTING LOW FLOWS AND FLOODS FROM UNGAGED DRAINAGE BASINS,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08820

ESTIMATION FLOODS SMALL DRAINAGE AREAS IN MONTANA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4A.
W75-08821

METEOROLOGY AND HYDROLOGY OF RAPID CITY FLOOD,
Corps of Engineers, Omaha, Nebr. Hydrology and Meteorology Section.
K. A. Johnson.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 451-455, 1973. 4 tab.

Descriptors: *Floods, *Hydrology, *Meteorology, Rainfall, Cloudbursts, Runoff, Peak discharge, Flood discharge, Dam failure, Dams, Spillways, Flash floods, Historic floods, Disasters, *South Dakota.
Identifiers: *Rapid City(SD).

The June 1972 storm and flood that struck City. It should be recognized, however, that the sheer magnitude and intensity of the storm and resulting flood event were the major causative factors of the disaster. The pertinent meteorological and hydrologic features of the June flood in Rapid City were briefly described. (See also W75-08786) (Sims-ISWS)
W75-08824

INDEX TO MAPS TO FLOOD-PRONE AREAS IN INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7C.
W75-08834

2F. Groundwater

AN APPLICATION OF PARAMETRIC STATISTICAL TESTS TO WELL-YIELD DATA FROM CARBONATES OF CENTRAL PENNSYLVANIA,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 4B.
W75-08388

DRAWDOWN DISTRIBUTION DUE TO WELL FIELDS IN COUPLED LEAKY AQUIFERS: 2. FINITE AQUIFER SYSTEM,
Illinois Univ., Chicago. Dept. of Geological Sciences.
Z. A. Saleem, and C. E. Jacob.
Water Resources Research, Vol 10, No 2, p 336-342, April 1974. 1 fig, 14 ref.

Descriptors: *Drawdown, *Artesian aquifers, *Withdrawal, *Water table, Groundwater movement, Equations, Mathematical studies, Leakage, Water wells.
Identifiers: *Leaky aquifers.

Solutions are given for the drawdown distribution due to the operation of wells fields in coupled leaky aquifers of finite areal extent. A transform to solve the flow problem was obtained by modification of the zero-order Hankel transform. Two

cases of the problem are analyzed. Case 1 concerns the upper aquifer when it is confined or unconfined and the drawdown on it is very small compared with its saturated thickness. Case 2 concerns the upper unconfined aquifer when the drawdown in it can be significant in relation to its saturated thickness. Approximate solutions and solutions for special cases were obtained in addiiton to the exact solutions. The solutions are in the form of series that can readily be evaluated. (See also W74-02773) (Knapp-USGS)
W75-08389

HYDROGEOLOGY OF THE EDMONTON AREA (NORTHWEST SEGMENT), ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 4B.
W75-08398

HYDROGEOLOGY OF THE GLEICHEN AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 4B.
W75-08399

ANALYSIS OF PUMPING TEST DATA FROM ANISOTROPIC UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
S. P. Neuman.
Water Resources Research, Vol 11, No 2, p 329-342, April 1975. 9 fig, 2 tab, 22 ref.

Descriptors: *Groundwater, *Aquifers, *Aquifer characteristics, *Aquifer testing, *Mathematical studies, Pump testing, Testing, Drawdown, Specific yield, Water wells, Unsteady flow, Equations, Anisotropy, Analysis, Observation wells.
Identifiers: Delayed yield, Gravity drainage, Type-curve solutions, Partial penetration effects.

A new analytical model was proposed for the delayed response process characterizing flow to a well in an unconfined aquifer. The new approach was based only on well-defined physical parameters of the aquifer system. As such, it can be used to develop methods for determining the hydraulic properties of anisotropic unconfined aquifers from field drawdown data. Two methods of analysis were described, one based on the matching of field data with theoretical type curves and the other based on the semi-logarithmic relationship between drawdown and time. These methods were illustrated by applying them to field pumping tests. Similar procedures can be used to analyze data from partially penetrating wells, but this requires that a special set of theoretical curves be developed for each field situation. Such theoretical curves can easily be developed with the aid of a computer program. An explicit mathematical relationship was derived between Boulton's delay index and the physical characteristics of the aquifer. It was shown that contrary to the assumption of Boulton the delay index is not a characteristic constant of the aquifer but decreases linearly with the logarithm of the radial distance from the pumping well. This discovery makes it possible to reinterpret the results of pumping tests that were previously obtained with the aid of Boulton's theory without necessarily reexamining the original drawdown data. Results from pumping tests were used to illustrate this last point. (Prickett-ISWS)
W75-08434

A STOCHASTIC MODEL OF DISPERSION IN A POROUS MEDIUM,
Ecole Polytechnique, Montreal (Quebec).
P. Todorovic.
Water Resources Research, Vol 11, No 2, p 348-354, April 1975. 4 fig, 10 ref.

Descriptors: *Stochastic processes, *Dispersion, *Porous media, *Groundwater, Equations, Mathematical studies, Diffusion, Groundwater movement, Diffusivity, Statistical methods, Saturated flow, Mass transfer, Model studies, Hydraulics, Probability.
Identifiers: *Kinematic motion, *Random walk.

A set of tagged particles released in a flow through a porous medium is subject to random dispersion. For a statistically homogeneous and isotropic porous medium a stochastic model of longitudinal dispersion was determined, provided the fluid flow was steady and no mass transfer occurs between the solid phase and the fluid. A stochastic model was presented to describe longitudinal dispersion of a set of tagged particles released continuously (but not necessarily at uniform rate) in a flow through a porous structure. The model depends on two constant parameters which in turn depend on the properties of the porous medium and hydraulic conditions. It was emphasized that the model presented was kinematic in the sense that it treated only the statistical properties of the law of motion of a tagged particle in a flow through a porous medium and did not go into particulars of dynamic conditions. Consequently, it did not explicitly contain parameters of the hydraulic forces leading to this motion. (Prickett-ISWS)
W75-08435

A STUDY BY THE FINITE-ELEMENT METHOD OF THE INFLUENCE OF FRACTURES IN CONFINED AQUIFERS,
Dundee Univ. (Scotland).
A. B. Gureghian.
Society of Petroleum Engineers Journal, Vol 15, No 2, p 181-191, April 1975. 15 fig, 1 tab, 17 ref, 1 append.

Descriptors: *Groundwater, *Fracture permeability, *Finite element analysis, *Model studies, *Anisotropy, Cracks, Fissures(Geologic), Mathematical studies, Numerical analysis, Analog models, Borehole geophysics, Subsurface investigations, Limestones, Wells, Confined water.
Identifiers: *Electrolytic model, *Fracture flow capacity, Three-dimensional flow.

A treatment was presented of the effect of sand-filled fractures in a confined aquifer on the flow behavior, particularly flow to a fully penetrating well. The mathematical study was based on the variational method and the computation was carried out by using the finite-element method. A new governing equation was derived based on the variational principle applicable to the fracture problem and its form was explained. Experimental checks were carried out with an electrolytic tank. The investigations determined the potential distribution and the borehole discharge in relation to the fracture flow capacity (that is, the ratio of the permeability of the fracture to the permeability of the surrounding formation), length, position, and orientation of fractures. The effect of horizontal and vertical anisotropy was also investigated. (Prickett-ISWS)
W75-08443

GEOCHEMISTRY OF GROUNDWATERS IN THE CHAD BASIN,
Geological Survey of Israel, Jerusalem.
For primary bibliographic entry see Field 2K.
W75-08445

DISPERSION EFFECT ON BUOYANCE-DRIVEN CONVECTION IN STRATIFIED FLOWS THROUGH POROUS MEDIA,
Oslo Univ. (Norway). Inst. of Mathematics.
J. E. Weber.
Journal of Hydrology, Vol 25, No 1/2, p 59-70, April 1975. 16 ref, 1 append.

Descriptors: *Groundwater, *Porous media, *Geothermal studies, *Dispersion, *Mathematical

studies, Water temperature, Thermal stratification, Convection, Heated water, Mass transfer, Buoyancy, Gravitational water, Equations, Darcys law, Hydrodynamics, Heat flow, Solutes.
Identifiers: *Thermally driven flow, *Peclet numbers.

The effect of hydrodynamic dispersion on the onset of convection in flows through porous media was theoretically studied. The medium was isotropic, and bounded by two horizontal impermeable planes having a constant concentration difference. Pressure-driven as well as thermally-driven basic flows were considered. The investigations were valid in the limit of small and large Peclet numbers. The analysis showed that the onset of convection is independent of the longitudinal dispersion coefficient, while lateral dispersion always has a stabilizing effect. The preferred mode of instability is stationary, two-dimensional disturbances with axes aligned in the direction of the basic flow (longitudinal rolls). (Prickett-ISWS)
W75-08447

THE CHALK GROUNDWATER TRITIUM ANOMALY--A POSSIBLE EXPLANATION,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
S. S. D. Foster.
Journal of Hydrology, Vol 25, No 1/2, p 159-165, April 1975. 2 fig, 10 ref.

Descriptors: *Groundwater, *Groundwater movement, *Saturated flow, *Tritium, Diffusion, Dispersion, Permeability, Porosity, Pore water, Carbonate rocks, Fissures(Geologic).
Identifiers: *British Chalk aquifer, Thermonuclear tritium.

Attention was drawn to a mechanism which could profoundly complicate the interpretation of tritium determinations in investigations of the rate of groundwater movement in the British Chalk and other physically-comparable formations. It could explain the anomalously low levels of thermonuclear tritium currently observed in the saturated zone of the Chalk aquifer, with important implications for pollution control. (Gibb-ISWS)
W75-08449

INVESTIGATION OF VERTICAL GROUND-WATER FLOW IN BOREHOLES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
M. Bardhan.
Journal of Hydrology, Vol 25, No 1/2, April 1975. 2 fig, 9 ref.

Descriptors: *Groundwater, *Groundwater movement, *Wells, *Logging(Recording), *Radioactive well logging, Boreholes, Neutron absorption, Flow, Seepage, Sinks.
Identifiers: Vertical flow, Gamma-gamma logs, Neutron-neutron logs.

An integrated nuclear approach involving conjunctive application of gamma--gamma and neutron--neutron depth gages and a strong neutron-absorbent tracer (boron) was followed to locate the source and sink zones supporting vertical groundwater flow as well as quantifying the flow volume in uncased sub-artesian borewells sunk in trappean terrains. The results were utilized in calculating the seepage loss from the saturated zone into the unsaturated zone through the well bore, which in turn aided in decision-making relating to the design of production wells in the areas studied. (Gibb-ISWS)
W75-08450

NON-EQUALIBRIUM THERMODYNAMIC TREATMENT OF TRANSPORT PROCESSES IN GROUND-WATER FLOW,
Nevada Univ., Reno. Desert Research Inst.
C. L. Carnahan.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 311, $4.75 in paper copy, $2.25 in microfiche. Water Resources Research Center, Publication No 24, May 1975. 83 p, 2 fig, 2 tab, 49 ref. OWRT B-067-NEV(2). 14-31-0001-4103.

Descriptors: *Chemical potential, Chemical reactions, Chemistry, Groundwater, *Thermodynamics, *Base flow, *Groundwater movement, Porous media, *Dispersion, Equations, Model studies, *Path of pollutants.

The theory of non-equilibrium thermodynamics is applied to transport processes in ground-water flow systems. The theory and the manner in which it can be applied to natural processes are described. The theory is postulated to be applicable to a continuum model of porous medium in which fluxes and forces at points in the fluid phase are averaged over a representative elementary volume. Phenomenological equations appropriate to ground-water flow systems are derived to illustrate the presence of coupled phenomena in dispersive processes and simultaneous transport of heat and matter. It is proposed that phenomenological coefficients for coupled and direct dispersive processes be formed of the product of a fourth-rank tensor, dispersivity of the medium, with the dyadic product of solute velocities, rather than with fluid flow velocities. Group theory is applied to resulting coefficients, and new results are obtained for the forms assumed by the coefficients in certain anisotropic media. (Fallon-Nevada)
W75-08488

MEASUREMENT OF THE HORIZONTAL COMPONENT OF GROUND WATER FLOW USING A VERTICALLY POSITIONED IN-SITU THERMAL PROBE,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
S. G. McLin, M. A. Reiter, and A. R. Sanford.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 312, $4.25 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No 055, May 1975. 34 p, 13 fig, 3 tab, 3 ref. OWRT A-044-NMEX(1).

Descriptors: *Instrumentation, *Groundwater movement, *Base flow, *Measurement, Thermal conductivity, Isotherms, *Calibration, *Flow rates, Boreholes.
Identifiers: *Thermal probe.

A thermal probe for the in-situ measurement of groundwater flow rates in a borehole was calibrated in a vertical position. The probe is a long slender metal rod having a heat source along its entire length and a temperature sensor at its midpoint. When a constant quantity of heat is applied to the probe, the rise in temperature is inversely related to the rate of water flowing past the probe. Full scale calibration of the probe was considered necessary because theoretical studies over-simplify the interaction between the heated probe and the horizontal flow of groundwater. Fifty eight calibration runs of the thermal probe were made; most of these tests were used to perfect the experimental techniques of data gathering and the design of the calibration tank. Fourteen of the calibration tests were selected to construct preliminary calibration curves. The selection of specific tests was based on a statistical analysis of the A1 coefficients from a third order polynomial fit of the experimental data. Final calibration curves were constructed on the basis of the ten calibration tests. These curves show that if a temperature difference of 0.1 degree Centegrade can be measured at the end of a two hour test, the probe is capable of distinguishing small differences in specific discharges when the flow exceeds 120 cm/day. (Hain-New Mexico State)
W75-08490

EVALUATION OF RECHARGE POTENTIAL NEAR INDIO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W75-08493

BASIC GROUND-WATER DATA FOR THE MOSCOW BASIN, IDAHO,
Geological Survey, Boise, Idaho.
E. G. Crosthwaite.
Open-file report, 1975. 96 p, 7 fig, 2 tab, 23 ref, append.

Descriptors: *Basic data collections, *Hydrologic data, *Idaho, *Groundwater, Aquifers, Basalts, Water wells, Water levels, Water yield, Groundwater basins.
Identifiers: *Moscow basin(Idaho).

The Moscow basin encompasses an area of 65 square miles in Latah County and borders the Idaho-Washington State line. The basin is along the eastern edge of the 'Palouse Country' where the rolling Palouse hills merge with the low mountains of northern Idaho. All water supplies for the basin are derived from wells and springs. Virtually all large-capacity wells are owned by the city of Moscow and the University of Idaho. These wells are open to the basalt of the Columbia River Group and the interbedded sands in the Latah Formation. Presented are a table of well records, well logs, a table of annual groundwater withdrawals, water levels in observation wells, a contour map showing the approximate elevation of the water level in the upper series of basalt flows and interbedded sediments in the southern part of the area, and a bibliography of the more important reports pertaining to groundwater in the area. (Knapp-USGS)
W75-08499

CHEMISTRY OF SUBSURFACE WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-08506

ESTIMATED YIELD OF FRESH-WATER WELLS IN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-08507

GROUND-WATER CONDITIONS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08509

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE CHERRYFIELD-JONESBORO AREA, MAINE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08510

SALINE GROUND-WATER RESOURCES OF LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
D. H. Boggess.
Open-file report FL 74-247, 1974. 62 p, 10 fig, 5 tab, 7 ref, append.

Descriptors: *Saline water, *Florida, *Groundwater, Hydrogeology, Groundwater movement, Hydrologic data, Withdrawal, Water levels, Saline water intrusion.
Identifiers: *Lee County(Fla).

Lee County, Florida is underlain at depths greater than 400 feet by formations containing saline water. Two saline water-bearing zones occur

within the depth interval 400 to 1,200 feet; the upper zone is termed the lower Hawthorn aquifer and the lower zone is termed the Suwannee aquifer. Fresh water infiltrates into the aquifers in the central highlands regions of Florida where water levels are as much as 130 feet above sea level. The water subsequently moves southwestward becoming progressively more saline toward the coast. Both aquifers are under sufficient artesian pressure to cause wells tapping them to flow at land surface. Artesian pressure in the aquifers has been reduced along the Caloosahatchee River by heavy withdrawal and this reduction in pressure is a major factor in deterioration of water quality in the McGregor Isles area, south of Fort Myers. The saline water from the lower Hawthorn and Suwannee aquifers is hard and sulfurous. The dissolved solids range from 700 to 3,300 mg/litre. (Knapp-USGS)
W75-08517

SOIL MOISTURE MOVEMENT UNDER TEMPERATURE GRADIENTS,
Department of Irrigation, Colombo (Sri Lanka). Land Use Div.
For primary bibliographic entry see Field 2G.
W75-08597

GEOELECTRICAL POSSIBILITIES OF DETECTING STREAM CHANNELS IN CARBONATE ROCKS,
Missouri Univ., Rolla.
R. K. Frohlich.
Arkansas Academy of Science Proceedings, Vol 26, p 71-72. 1972, 3 fig, 3 ref. OWRR A-046-Mo(4) 14-01-0001-3825.

Descriptors: Karst, Streams, Channels, *Resistivity, *Underground streams, Electrical networks, *Carbonate rocks, *Karst hydrology, *Subsurface flow.

Several geoelectrical resistivity methods that may be used to determine the position and flow characteristics of underground water associated with carbonate bedrock and karst development are considered. The most promising method studied employs depth soundings patterned after Schlumberger. The plotting of half electrode separation against apparent resistivity yields a curve which may be used to discriminate between lateral and vertical inhomogeneities in bedrock. A network of depth soundings of this type ultimately may lead to a map that will show geoelectrical anisotropies that may be used to analyze subsurface water courses in carbonate rock.
W75-08603

CARBON 14 DATING OF GROUNDWATER FROM CLOSED AND OPEN SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
T. M. L. Wigley.
Water Resources Research, Vol 11, No 2, p 324-328, April 1975. 2 fig, 1 tab, 14 ref.

Descriptors: *Isotope studies, *Carbon radioisotopes, *Radioactive dating, *Groundwater recharge, Stable isotopes, Isotope fractionation, Geochemistry, Temperature, Aquifer systems, Hydrogeology, *Florida, Groundwater, Aquifers. Identifiers: Mass balance method, *Arcadia aquifer(Fla).

Groundwaters may be dated by using carbon 14, provided that the raw data are properly adjusted. However, adjustment factors determined from geochemical or isotopic measurements and based on simple models of carbonate dissolution do not always agree with adjustment factors obtained by independent means. Established adjustment methods were reinterpreted in terms of closed and open system models of carbonate dissolution, and it was suggested that these models provide a sounder framework for determining adjustment

factors. Hypothetical and real examples were considered, and it was shown that some otherwise anomalous results may be explained in terms of the closed and open system models. (Schicht-ISWS)
W75-08707

AN APPROXIMATE INFINITE CONDUCTIVITY SOLUTION FOR A PARTIALLY PENETRATING LINE-SOURCE WELL,
Bureau de Recherches Geologiques et Minieres, Orleans (France).
For primary bibliographic entry see Field 4B.
W75-08715

RESEARCH AND ADVANCES IN GROUNDWATER RESOURCES STUDIES, 1964-1974,
Florida Water Management District, Brooksville.
G. G. Parker, and A. I. Johnson.
In: A Decade of Progress in Water Resources: American Water Resources Association, Proceedings, Series No 19, p 42-75, March 1974.

Descriptors: *Bibliographies, *Publications, *Groundwater, *Groundwater resources, Information retrieval, Groundwater availability, Groundwater movement, Model studies, Hydrologic data, Aquifer characteristics, Water quality, Water pollution sources, Legal aspects, State governments, Federal government, Water law.

Approximately 800 bibliographic entries including most of the published works on groundwater research in the United States, both basic and applied, during the period 1964-1974, are listed in alphabetical order by author. In the past 10 years there has been a predominant shift to the inclusion of groundwater studies and other aspects of water resources including surface water and soil moisture, and the influences of the entire environmental framwork in which water occurs. Further, the trend is away from the descriptive and qualitative to the evaluative and quantitative. Most current reports are made in the context of systems analysis and commonly include modeling, either digital or electric analogue models and in a growing number of studies use is made of hybrid models. Because water law is currently undergoing changes both in the State and Federal governments, important water-law entries have been included. (Woodard-USGS)
W75-08825

ONE-DIMENSIONAL SIMULATION OF AQUIFER SYSTEM COMPACTION NEAR PIXLEY, CALIFORNIA: 1. CONSTANT PARAMETERS,
Geological Survey, Sacramento, Calif.
D. C. Helm.
Water Resources Research, Vol 11, No 3, p 465-478, June 1975. 8 fig, 4 tab, 20 ref.

Descriptors: *Land subsidence, *Aquifer characteristics, *Pumping, *Mathematical models, Forecasting, Water levels, *California, Geomorphology, Hydrogeology, Evaluation, Water level fluctuations, Compaction, Soil physical properties, Model studies, Aquitards, Simulation analysis.
Identifiers: *Pixley(Calif).

One of the major problems facing groundwater hydrologists is how to predict subsidence of the land surface due to extraction of underground fluid. Aggregate one-dimensional compaction (consolidation) of a series of aquitards in a compacting aquifer system has been simulated through use of a finite difference representation of the vertical stress distribution within an idealized aquitard. Among the parameters affecting the simulated compaction are two storage coefficients (compressibility values), one for recoverable and the other for nonrecoverable compression. These two storage coefficients introduce a transient

heterogeneity within an aquitard that is generally ignored by hydrologists. A computer program with two sets of constant coefficients calculates the daily deformation due to observed changes in applied stress near Pixley, California. Although water levels fluctuate annually, no long-term water level decline occurred near Pixley between January 1, 1959, and February 4, 1971. During this period, 3.19 ft to compaction was observed. The net difference between simulated and observed compaction on February 4, 1971, was 1.3% of the observed value. Maximum deviation occurred in mid-1964 and equaled 7% of the observed compaction. (Woodard-USGS)
W75-08826

BOUGUER GRAVITY ANOMALY MAP OF THE TEMECULA AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 7C.
W75-08831

2G. Water In Soils

REPORT AND INTERPRETATIONS FOR THE GENERAL SOIL MAP OF PIMA COUNTY, ARIZONA,
Soil Conservation Service, Portland, Oreg.
M. L. Richardson, and M. L. Miller.
USDA Soil Conservation Service and Pima County Natural Resource Conservation District, July 1973, 49 p, 3 tab, 2 append, 1 map, 4 refs.

Descriptors: *Soil groups, *Soil properties, *Soil temperature, *Soil surveys, *Maps, Water management, Soil classification, Arid lands, Recreation, Soil structure, Soil texture, Drainage, Depth, Slopes, Gravels, *Arizona, Regional analysis, Flood plains, Alluvial channels.
Identifiers: Pima County(Arizona).

Fifteen major soil associations found in Pima County, Arizona, are described, giving the setting in which the soils occur, the proportion of major and important minor soils present, and a brief description of the major soils classified according to the national classification system. Tables list not only estimated soil properties and suitability for selected uses, but also soil limitation ratings and soil features affecting select engineering, non-farm, recreational, and water management uses for the major soil components. The soil map was designed for use in general planning, showing general locations of soils suitable for particular uses, but on-site investigations are recommended for more detailed planning. (Mastic-Arizona)
W75-08373

RESPONSE OF AN UNSATURATED SOIL TO FOREST TRANSPIRATION,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2D.
W75-08436

GEOCHEMICAL FACIES OF SEDIMENTS,
Geologisch-Palaeontologisches Institut der Universitat (West Germany).
For primary bibliographic entry see Field 2J.
W75-08462

NITRATE AND NITRITE REDUCTION IN FLOODED GAMMA-IRRADIATED SOIL UNDER CONTROLLED PH AND REDOX POTENTIAL CONDITIONS,
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
For primary bibliographic entry see Field 5G.
W75-08470

HEAT AND MOISTURE CONDUCTION IN UN-
SATURATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Chemical
Engineering.
For primary bibliographic entry see Field 5B.
W75-08477

WATER AND SOLUTE TRANSPORT IN LAKE-
LAND FINE SAND,
Florida Univ., Gainesville. Dept. of Soil Sciences.
For primary bibliographic entry see Field 5B.
W75-08480

WATER INTAKE RATES ON A SILT LOAM
SOIL WITH VARIOUS MANURE APPLICA-
TIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural
Engineering.
O. E. Cross, and P. E. Fischbach.
Transactions of the ASAE (American Society of
Agricultural Engineers), Vol 16, No 2, p 282-284,
March-April, 1973. 9 fig, 5 ref.

Descriptors: *Irrigation practices, *Permeability,
Soil Physics, Soil structure, Soil ammendments,
Soil density, Soil management, Soil texture, Or-
ganic matter, *Farm wastes, Water pollution con-
trol.

Feedlot manure was applied to and incorporated
into a sharpsburg silt loam soil. Four levels of
manure were applied and the plots disk plowed to
three depths. During 1970 the crops were irrigated
three times and during 1971, four times. Water in-
filtration rates were determined from data of the
inflow-outflow method. The initial water intake
rate increased as the quantity of manure applica-
tion increased. The basic water intake rate in-
creased as more time from date of manure applica-
tion had elapsed. Manure application decreased
the basic intake rate as compared to the basic in-
take rate of non-manured silt loam soil. Depth of
plowing did not appreciably affect the basic intake
rate. (Skogerboe-Colorado State)
W75-08574

MICROBIAL   AVAILABILITY   OF
PHOSPHORUS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W75-08578

SOIL MOISTURE MOVEMENT UNDER TEM-
PERATURE GRADIENTS,
Department of Irrigation, Colombo (Sri Lanka).
Land Use Div.
W. D. Joshua, and E. De Jong.
Can J Soil Sci, Vol 53, No 1, p 49-57, 1973.

Descriptors: Soil moisture, *Soil water movement,
*Thermocline, *Sands, Loam, Thermodynamics,
*Analytical techniques.
Identifiers: Temperature gradients, Sandy loam,
Irreversible thermodynamic theory.

Temperature gradients of 0.5, 1.0, and 1.5 degree
C/cm were imposed on sealed soil columns of a
fine sandy loam at various moisture contents.
When steady state was reached, heat flux, tem-
perature distribution, and moisture content or
moisture tension distribution were measured. The
coupling between heat and moisture flux was cal-
culated using the theory of irreversible ther-
modynamics. The coupling between heat and
moisture flux was negligible for tensions less than
0.1 bar or higher than 15 bars. Coupling increased
as the temperature increased. Within experimental
error, Onsager's relation for the interaction
between heat and moisture flow was valid. The
agreement between the thermodynamic approach
and the 'series-parallel' theory was satisfactory
between 0.3- and 15 bar tension. At tensions above
15 bars or below 0.1 bar, the series-parallel theory
predicted more interaction between heat and

moisture flow than was observed. The coupling
between heat and moisture flow was significant
only when the moisture flow occurred in the liquid
phase and when soil-water interaction was
pronounced.--Copyright 1973, Biological Ab-
stracts, Inc.
W75-08597

RESPONSE OF THREE CORN HYBRIDS TO
LOW LEVELS OF SOIL MOISTURE TENSION
IN THE PLOW LAYER,
Agricultural Research and Educational Center,
Quincy, Fla.
For primary bibliographic entry see Field 3F.
W75-08600

EMITTER VALVE FOR SOIL IRRIGATION,
Salco Products, Inc., Los Angeles, Calif.
(assignee)
For primary bibliographic entry see Field 3F.
W75-08614

MOISTURE RESPONSIVE APPARATUS FOR
CONTROLLING MOISTURE CONTENT OF
SOIL,
For primary bibliographic entry see Field 3F.
W75-08615

SIMULATION MODEL FOR EVAPOTRANS-
PIRATION OF WHEAT: EMPIRICAL AP-
PROACH,
Agricultural Research Organization, Bet Dagan
(Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2D.
W75-08712

POLLUTION OF OPEN WATERS BY PESTI-
CIDES ENTERING FROM AGRICULTURAL
AREAS, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hy-
giene (USSR).
For primary bibliographic entry see Field 5B.
W75-08729

2H. Lakes

THE CONTRIBUTION OF AGRICULTURE TO
EUTROPHICATION OF SWISS WATERS: I.
RESULTS OF DIRECT MEASUREMENTS IN
THE DRAINAGE AREA OF VARIOUS MAIN
DRAINAGE CHANNELS,
Eidgenoessische   Technische   Hochschule,
Kastienbaum (Switzerland). Hydrobiology Lab.
For primary bibliographic entry see Field 5B.
W75-08376

TEMPERATURES SELECTED SEASONALLY
BY FOUR FISHES FROM WESTERN LAKE
ERIE,
Ohio State Cooperative Fishery Unit, Columbus.
For primary bibliographic entry see Field 5C.
W75-08381

NEMATODES OF LAKE BALATON: III. THE
FAUNA IN LATE-SUMMER,
Research Inst. for Water Resources Development,
Budapest (Hungary). Water Quality and Technolo-
gy Dept.
For primary bibliographic entry see Field 5C.
W75-08385

THE SPECIFIC SURFACE AREA OF CLAYS IN
LAKE SEDIMENTS--MEASUREMENT AND
ANALYSIS OF CONTRIBUTORS IN LAKE KIN-
NERET, ISRAEL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil
and Water Science.
For primary bibliographic entry see Field 2J.
W75-08428

PHOSPHORUS SOURCES FOR LOWER GREEN
BAY, LAKE MICHIGAN,
Wisconsin Univ., Green Bay. Ecosystems Analy-
sis.
For primary bibliographic entry see Field 5B.
W75-08467

DEVELOPMENT   OF   A   MANAGEMENT
FRAMEWORK OF THE GREAT SALT LAKE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W75-08473

WATER QUALITY OF THE LAKE SISKIYOU
AREA AND A REACH OF UPPER SACRAMEN-
TO RIVER BELOW BOX CANYON DAM,
CALIFORNIA, MAY 1970 THROUGH SEP-
TEMBER 1971,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-08521

EVALUATION OF BACTERIAL PRODUCTION
IN A POND IN SOLOGNE, (IN FRENCH),
Centre National pour l'Exploitation des Oceans,
Paris (France).
For primary bibliographic entry see Field 5C.
W75-08534

GROWTH OF THE BLUE-GREEN ALGA
MICROCYSTIS   AERUGINOSA   UNDER
DEFINED CONDITIONS,
Nebraska Univ., Lincoln. Dept. of Chemical En-
gineering.
For primary bibliographic entry see Field 5C.
W75-08579

STATUTORY DEFINITIONS OF FRESHWATER
WETLANDS.
For primary bibliographic entry see Field 6E.
W75-08594

RADIOLOGICAL   AND   ENVIRONMENTAL
RESEARCH DIVISION ANNUAL REPORT,
ECOLOGY, JANUARY - DECEMBER 1973.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W75-08670

NUMERICAL ANALYSIS OF WARM, TURBU-
LENT SINKING JETS DISCHARGED INTO
QUIESCENT WATER OF LOW TEMPERA-
TURE,
Iowa Univ., Iowa City. Inst. of Hydraulic
Research.
For primary bibliographic entry see Field 5B.
W75-08684

TRAJECTORIES AND SPEEDS OF WIND-
DRIVEN CURRENTS NEAR THE COAST,
Louisiana State Univ., Baton Rouge. Coastal Stu-
dies Inst.
S. P. Murray.
Journal of Physical Oceanography, Vol 5, No 2, p
347-360, April 1975. 15 fig, 1 tab, 28 ref. NR 388
002. ONR Contract N00014-69-A-0211-0003.

Descriptors: *Rheotropism, *Coasts, *Lake
breezes, *Sea breezes, Ocean currents, Drift bot-
tles, Flow, Movement, Water circulation, Coriolis
force, Eddies, Winds, Currents(Water), On-site
investigations.
Identifiers: Drogues.

Detailed observation of drogue movements within
800 m of a straight shoreline indicates the primary
current generated by local winds to be directed
within a few degrees of parallel to the shore nearly
independently of wind direction. Subtle vertical
structure in the onshore-offshore speed com-

ponent is dependent on vertical stratification such that unstratified water produces a two-layer flow (onshore in the surface layer, off-shore in the bottom layer), and moderately stratified water produces a three-layered flow (onshore in surface and bottom layers, offshore at intermediate depths). Theoretical conclusions from Jeffreys' constant eddy viscosity theory support the unstratified velocity profile and accurately predict the alongshore current speeds. Numerical solutions with a depth-dependent eddy viscosity indicate that the three-layered flow pattern is a direct result of the density gradient. Even in these shallow waters the inclusion of Coriolis effects in the theory is necessary for a complete understanding of the current observations. Simple theoretical calculations on the response characteristics of various sized surface-tracked drogues as a function of wind speed indicate that drogue size should be carefully selected in terms of expected magnitudes of wind and current speeds. (Jess-ISWS)
W75-08694

THE EFFECT OF WIND AND SURFACE CURRENTS ON DRIFTERS,
Texas A and M Univ., College Station. Dept. of Oceanography.
A. D. Kirwan, Jr., G. McNally, M-S., Chang, and R. Molinari.
Journal of Physical Oceanography, Vol 5, No 2, p 361-368, April 1975. 8 fig, 2 tab, 1 ref.

Descriptors: *Rheotropism, *Ocean currents, *Lake breezes, *Sea breezes, Drift bottles, Flow, Movement, Water circulation, Coriolis force, Winds, Theoretical analysis, Velocity, Currents(Water).
Identifiers: Drifters, Wind currents, Surface currents.

The motion of a drifter acted on by wind, surface, and subsurface currents was analyzed. From the condition of static equilibrium of all drag forces acting on the drifter, the effects of wind and surface current of arbitrary direction and magnitude and drogue characteristics were examined parametrically. Specific application was made to a recently developed drifter with 9.2 and 11.85 m parachute drogues and a window shade drogue. The calculations show that for some environmental conditions the deviation between the magnitudes of the drifter velocity and the water parcel velocity may exceed 50%. Furthermore, the direction of velocity vectors may differ by as much as 45 degrees. Drifter data from an experiment conducted by the Atlantic Oceanographic and Meteorological Laboratories and the NOAA Data Buoy Office in the Gulf of Mexico Loop Current were examined in light of the theoretical results. The wind effects predicted by the theory were observed in the field. Thus, wind corrections to the drifter velocity records which are based on the theory can significantly improve the velocity records. (Jess-ISWS)
W75-08695

ON THE TIME-DEPENDENT FLOW IN A LAKE,
Case Western Reserve Univ., Cleveland, Ohio.
A. Haq, and W. Lick.
Journal of Geophysical Research, Vol 80, No 3, p 431-437, January 20, 1975. 6 fig, 16 ref.

Descriptors: *Lakes, *Flow, *Mathematical models, *Circulation, Model studies, Computer models, Equations, Surface waters, *Lake Erie, Great Lakes, Hydrodynamics, Path of pollutants.

The time-dependent flow in a constant depth basin was investigated. Various time scales of interest were explicitly identified and simple analytical formulas for these time scales were derived. In addition, the rigid lid and free surface models were compared. The results were verified by comparison with numerical calculations. (Sims-ISWS)
W75-08703

CHEMICAL AND BIOLOGICAL INDICES OF EUTROPHICATION OF THE LUBACHOW RESERVOIR,
Panstwowy Instytut Hydrologiozno-Meteorologiczny, Wroclaw (Poland).
For primary bibliographic entry see Field 5C.
W75-08765

EUTROPHICATION OF BAIKAL LAKE,
For primary bibliographic entry see Field 5C.
W75-08766

RELATIONS BETWEEN NUTRIENT BUDGET AND PRODUCTIVITY IN PONDS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
For primary bibliographic entry see Field 5C.
W75-08767

LIMNOLOGICAL MODELS OF RESERVOIR ECOSYSTEM,
Ceskoslovenska Adademie Ved, Prague. Hydrobiologicka Laborator.
For primary bibliographic entry see Field 5C.
W75-08770

DRAWING OFF OF HYPOLIMNION WATERS AS A METHOD FOR IMPROVING THE QUALITY OF LAKE WATERS,
For primary bibliographic entry see Field 5C.
W75-08771

MODELING WIND INDUCED WATER CURRENTS,
Worcester Polytechnic Inst., Mass. Alden Research Labs.
For primary bibliographic entry see Field 5B.
W75-08816

PRIMARY PRODUCTION IN A GREAT PLAINS RESERVOIR,
For primary bibliographic entry see Field 5C.
W75-08846

2I. Water In Plants

CLASSIFICATION AND WORLD DISTRIBUTION OF VEGETATION RELATIVE TO V/STOL AIRCRAFT OPERATIONS,
Army Engineer Topographic Labs., Fort Belvoir, Va.
For primary bibliographic entry see Field 7B.
W75-08366

STUDIES ON FLOATING RICE: IV. EFFECTS OF RAINSING WATER LEVEL ON THE NITROGENOUS COMPOUNDS OF THE TOPS, (IN JAPANESE),
Kobe Univ. (Japan). Faculty of Agriculture.
T. Yamaguchi.
Proc Crop Sci Soc Jap, Vol 42, No 1, p 35-40, 1973. Illus. English summary.

Descriptors: *Rice, Nitrogen compounds.

Cultivars of floating and non-floating rice were grown under submerged condition by raising the water level. Total-, protein-, total soluble-, and amide plus ammonia-N of the floating and non-floating rice plants were compared with those under ordinary conditions. In another experiment, rice plants were grown under submerged condition by raising the water level and then lowering it. The various fractions of nitrogenous compounds of the leaf blade, leaf sheath and internode grown under submerged condition were compared with those under ordinary conditions. Under ordinary conditions, there were no significant differences in the contents of total-, protein-, and amide plus ammonia-N between the non-floating and floating rice, but the content of total soluble-N was slightly higher in floating rice, while concentrations of total-, protein-, and total soluble-N were higher in non-floating rice. The content of protein-N of non-floating rice was decreased, but that of floating rice was increased under submerged conditions. Concentration of protein-N decreased in both types with the submerging treatment. Total soluble-N in the non-floating rice was increased under submerged condition, while that of the floating rice showed no appreciable change. The content of amide plus ammonia-N increased markedly under sumberged conditions in both types of rice. Amide plus ammonia-N concentration of the non-floating rice was increased more markedly than that of the floating rice. The nitrogenous compounds of the leaf sheath and internode were more affected by submerging treatment than that of leaf blade. The ratios of total soluble-N or amide plus ammonia-N to protein-N became larger under submerged condition in the non-floating rice, while the change of the ratios remained narrow in the floating rice. Floating rice seems to maintain normal N metabolism under both ordinary and submerged conditions. (See also W75-02722)--Copyright 1974, Biological Abstracts, Inc.
W75-08375

THE EVAPORATION OF INTERCEPTED RAINFALL FROM A FOREST STAND: AN ANALYSIS BY SIMULATION,
Duke Univ., Durham, N.C. School of Forestry.
For primary bibliographic entry see Field 2D.
W75-08442

NITRATE UPTAKE EFFECTIVENESS OF FOUR PLANT SPECIES,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-08607

SEASONAL VARIATION OF SIEVING EFFICIENCY IN LOTIC HABITAT,
Commonwealth Scientific and Industrial Research Organization, Deception Bay (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5A.
W75-08609

DYNAMICS OF HIGHER PLANT WATER METABOLISM AND ITS INFORMATION SIGNIFICANCE, (IN RUSSIAN),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
V. G. Karmanov, O. O. Lyalin, G. G. Mamulashvili, S. N. Meleshchenko, and V. A. Nikishin.
Fiziol Biokhim Kul't Rast. Vol 6, No 1, p 69-75, Illus, 1974. (English summary)

Descriptors: *Plant physiology, *Beans, Vegetable crops, Crops, *Consumptive use, Water utilization.
Identifiers: USSR, Kidney beans.

A comparative study of hydrodynamic and bioelectric reactions occurring in a transpiring plant (kidney bean) in response to different external effects showed that hydrodynamic reactions are one of possible mechanisms of rapid information transfer from 1 organ of the plant to another. The dynamic parameters of the water regime were studied for obtaining information on physiological processes in the plant organisms without disturbing its integrity.--Copyright 1975, Biological Abstracts, Inc.
W75-08789

DYNAMICS OF FREE AMINO ACID CONTENT IN LEAVES OF WINTER WHEAT UNDER

VARIABLE CONDITIONS OF SOIL MOISTURE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
For primary bibliographic entry see Field 3F.
W75-08828

2J. Erosion and Sedimentation

A SCHEMATIZATION OF ONSHORE-OFFSHORE TRANSPORT,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W75-08401

EQUILIBRIUM PROFILES OF COARSE MATERIAL UNDER WAVE ATTACK,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W75-08402

THE ORIGIN OF FOLIATION IN GLACIERS: EVIDENCE FROM SOME NORWEGIAN EXAMPLES,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Institut.
For primary bibliographic entry see Field 2C.
W75-08410

DROP STONES RESULTING FROM SNOW-AVALANCHE DEPOSITION ON LAKE ICE,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-08411

SIZE SPECTRA OF BIOGENIC PARTICLES IN OCEAN WATER AND SEDIMENTS,
Physical Research Lab., Ahmedabad (India).
D. Lal, and A. Lerman.
Journal of Geophysical Research, Vol 80, No 3, p 423-430, January 20, 1975. 6 fig, 25 ref. NSF Grant GA-30769.

Descriptors: *Oceans, *Particle size, *Sea water, *Sediments, Suspended solids, Bottom sediments, Diatoms, Stokes law, Deposition(Sediments), Sedimentation rates, Settling velocity, Marine biology, Oceanography, Model studies.
Identifiers: Foraminifera.

Particle size spectra of foraminifera and diatoms in near-surface ocean water and sediments can generally be represented by a relationship of the type dN/dr = Ar to the (-b) power. Stokes settling of the particles of density that is uniform and independent of the particle radius r would result in the spectrum slope value of b - 2 in the sediment, when b characterizes the parent particle population in the water. For particles the density of which depends on r, such as for thin wall spheres filled with water, the difference between the spectrum slopes is unity, giving b - 1 in the sediment. From the data available, the values of b for sediments were on the average smaller by 0.7 than those of the spectrum slope in the settling samples. Dissolution of settling particles produces broad maximum near 3-5 micrometers in the particle size spectra (dN/dr) owing to the faster dissolution of the smaller particles. Also considered was a model of a particle fragmentation that assumes some fraction of the parent particle population breaks into fragments, and thus a residual population of whole particles is left behind. In this model the residual population of whole particles has the spectrum slope steeper (b + c) than in the parent population (b). The deduced size spectrum of fragments in this model was found to be nonlinear. The similarities and differences between this fragmentation model and the Rosin-Weibull distribution

law for fragmented materials were discussed. (Sims-ISWS)
W75-08424

THE SPECIFIC SURFACE AREA OF CLAYS IN LAKE SEDIMENTS--MEASUREMENT AND ANALYSIS OF CONTRIBUTORS IN LAKE KINNERET, ISRAEL,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
A. Banin, M. Gal, Y. Zohar, and A. Singer.
Limnology and Oceanography, Vol 20, No 2, p 278-282, March 1975. 1 fig, 3 tab, 17 ref.

Descriptors: *Lake sediments, *Sediment-water interfaces, *Nutrients, Adsorption, Chemical precipitation, Urbanization, Carbonates, Clay minerals, Chemical analysis, Ion exchange, X-ray analysis, Electron microscopy, Suspended solids, Water circulation, Particle size.
Identifiers: *Specific surface area, *Israel(Lake Kinneret), *Jordan River.

The specific surface area of recent sediments of Lake Kinneret was measured and the contributions of various sediment components to it were evaluated. Most of the lake sediments had specific surface areas (SSA) larger than 100 sq m/g. Average SSA of the sediments is 181.8 + or -59.7 sq m/g, whereas that of the noncarbonate fraction, constituting on the average 54.8 + or -12.3% by weight of the sediment, is 374.6 + or -106.9 sq m/g. Despite their high proportion in the sediment, carbonates contribute only a very small fraction of the SSA; clay minerals in the 0-2 micron size fraction, particularly smectite, contribute most of it. (Visocky-ISWS)
W75-08428

WELSH FLOODPLAIN STUDIES: THE NATURE OF FLOODPLAIN GEOMETRY,
University Coll. of Wales, Aberystwyth.
For primary bibliographic entry see Field 2E.
W75-08448

EROSION MODELING ON A WATERSHED,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
C. A. Onstad, and G. R. Foster.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 2, p 288-292, March-April 1975. 2 fig, 3 tab, 7 ref.

Descriptors: *Erosion rates, *Rill erosion, *Model studies, *Soil erosion, *Sediment yield, Watersheds(Basins), Sediment transport, Mathematical models, Runoff, Slopes, Sheet erosion, Surface runoff, Storm runoff, Deposition(Sediments), Iowa, Ohio.
Identifiers: *Universal Soil Loss Equation, Interrill erosion, Soil detachment.

An erosion-deposition model was described based on a modified form of the Universal Soil Loss Equation incorporating hydrologic variables. The sediment yield concept and computations involve calculating soil detachment potential and transport potential on a storm by storm basis and then comparing the two, resulting in sediment yields and deposition. All computations were made on a unit width basis and extended to the entire watershed, using an appropriate watershed transformation scheme. Calculations along the slope length were made on slope segments, each with different length and steepness. A procedure for estimating the relative contributions of rill and interrill erosion was also presented. The final result was an estimate of the rill and interrill erosion distribution on a watershed, indicating areas of severe erosion and deposition. The model was used to simulate the soil movement during 11 storms on two Midwest watersheds planted to contour corn. Predictions on the 82.8-acre Iowa watershed were better than those on the smaller 1.5-acre Ohio watershed. (Lee-ISWS)
W75-08459

GEOCHEMICAL FACIES OF SEDIMENTS,
Geologisch-Palaeontologisches Institut der Universitat (West Germany).
K. Krejci-Graf.
Soil Science, Vol 119, No 1, p 20-23, January 1975. 11 ref.

Descriptors: *Geochemistry, *Facies(Sedimentary), *Physicochemical properties, *Sediments, *Soils, Nitrates, Calcareous soils, Methane, Dolomite, Phosphates, Quartz, Aluminum, Clay minerals, Sedimentology, Petrology, Soil profiles, Diagenesis, Potassium compounds, Magnesium compounds, Iodine, Oil shales, Sodium chloride, Gypsum, Silica, Carbon, Fluorescence, Bromine, Calcium compounds, Manganese, Coals.
Identifiers: *Fossil bionomy, *Paleobiochemistry, *Lithified sediments, Chemical facies, Metamorphism.

Geochemical facies of sediments and soils (the chemical indicators of the environment) provide geologists with a means to reconstruct fossilized environments of past ages. Facies diagnosis may be based on analysis of fossil bionomy, paleobiochemistry, or geochemistry. Geochemical facies diagnosis may be based on main constituents (lithology, sedimentology, and soil profile); minor components (concentrations in the order of 0.01 or 0.001, or less: salinity, ion concentrations of Cl, Br, I, F, and P; Ca: Sr and 12C: 13C as well as 180: 160 ratios, and indications on redox potentials), or the type and nature of organic substances preserved (C : N ratios, biochemistry of carbohydrates, and enrichment in certain elements of coals, oil, and gas). Analysis of chemical facies from remains in lithified sediments should incorporate the physical chemistry of the compounds studied, as well as the changes that will take at high burial pressures and possible increase in temperature. (Sanderson-ISWS)
W75-08462

REDOX PROCESSES IN DIAGENESIS OF SEDIMENTS IN THE NORTHWEST PACIFIC OCEAN,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 2K.
W75-08463

HANS A. EINSTEIN'S CONTRIBUTIONS IN SEDIMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY5, Proceedings Paper 11290, p 469-488, May 1975. 1 fig, 74 ref, 2 append.

Descriptors: *Sedimentation, *Sediment transport, *Bed load, *Suspended load, Roughness(Hydraulic), Channels, Erosion, Flow resistance, Hydraulics, Hydraulic models, Boundary processes, *History.
Identifiers: *Hans A. Einstein.

Some of Einstein's major contributions (See W769-02690; W71-03995; W72-03851; W72-06482; and W74-03788) to the field of sedimentation were examined. Einstein established many firsts in his research on bed load and wash load, alluvial bed roughness, form resistance, bed load motion, application of stochastic analysis to sediment transport, instantaneous lift force on particles, and suspended load. Einstein also made significant contributions on secondary currents, erosion and deposition of cohesive material, flow fluctuation in a viscous sublayer, transport of bed particles due to oscillating flow motion, vorticity, deposition of suspended particles in a gravel bed, and sediment transport in pipes. (Visocky-ISWS)
W75-08466

SEDIMENT TRANSPORT THROUGH HIGH MOUNTAIN STREAMS OF THE IDAHO BATHOLITH,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
D. R. Neilson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 344, $4.75 in paper copy, $2.25 in microfiche. M S Thesis, April 1974. 83 p, 36 ref. OWRT B-025-IDA(2).

Descriptors: Streambeds, Aquatic habitats, *Sediment transport, Chinook salmon, *Carrying capacity, Aquatic life, Methodology, Measurement.
Identifiers: *Idaho Batholith, Bedload transport, Steelhead runs, Mountain streams.

The objectives were to determine the carrying capacity, allowable amounts of sediment and methods to measure levels of fine sediments of 0.25 inches or finer in mountain streams in the Idaho Batholith. The sources and the effects of the sand size sediments once they leave the mountain Batholith streams are not considered. Sediment discharge during the high water event of 1973, a year of minimal peak discharge, was insignificant. Projected transport rates using the Meyer-Peter, Muller formula, which shows good agreement with empirical data for Batholith streams, are presented. The allowable amount of fine sediments to enter these streams was determined by a sediment budget within limits established by the aquatic managers. A method of visually classifying the streambed, used by aquatic entomologists, correlated well with core samples for determining streambed composition.
W75-08483

ANALYSIS AND DESIGN OF SETTLING BASINS FOR IRRIGATION RETURN FLOW,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-08484

RECONNAISSANCE STUDY OF SEDIMENT TRANSPORT BY SELECTED STREAMS IN THE YAKIMA INDIAN RESERVATION, WASHINGTON, 1974 WATER YEAR,
Geological Survey, Tacoma, Wash.
P. R. Boucher.
Open-file report 75-67, 1975. 12 p, 1 fig, 1 tab, 5 ref.

Descriptors: *Sediment yield, *Sediment transport, *Washington, Sediment load, Mass wasting, Floods, Erosion, *Indian reservations.
Identifiers: *Yakima Indian Reservation(Wash).

Suspended-sediment concentrations and basin yields were measured at 21 sites on selected streams in the Yakima Indian Reservation in Washington, and two sites on nearby streams. Suspended-sediment yields were generally low relative to those of other streams in southeastern Washington, the southern Cascade Range, and the upper Columbia River basin. The highest annual sediment yield on the reservation probably is about 150 tons per square mile. The suspended sediment transported by this stream is largely from glacial outwash from Mount Adams. Other yields in the basin were estimated to be from 10 to 50 tons per square mile. Mass wasting is the principal cause of sediment transport in the streams studied. Some evidence of accelerated sediment production due to road construction was found along Surveyor Creek. During the flood of January 1974, which has a calculated recurrence interval of more than 100 years, the maximum observed suspended-sediment concentration was 7,830 milligrams per litre. An estimated 70,000 tons of sediment was transported from the upper Toppenish Creek basin; this was nearly 600 tons per square mile. However, the long-term average annual yield was estimated to be only about 30 tons per square mile. (Knapp-USGS)
W75-08518

THE ELECTRODEPOSITION AND DETERMINATION OF RADIUM BY ISOTOPIC DILUTION IN SEA WATER AND IN SEDIMENTS SIMULTANEOUSLY WITH OTHER NATURAL RADIONUCLIDES,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
For primary bibliographic entry see Field 5A.
W75-08538

EXCHANGEABLE INORGANIC PHOSPHATE IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W75-08577

MICROBIAL AVAILABILITY OF PHOSPHORUS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W75-08578

MODULAR EROSION CONTROL DEVICE,
For primary bibliographic entry see Field 8A.
W75-08611

CAVITATION DAMAGE SCALE EFFECTS--STATE OF ART SUMMARIZATION.
International Association for Hydraulic Research, Delft (Netherlands). Section for Hydraulic Machinery, Equipment and Cavitation.
For primary bibliographic entry see Field 8B.
W75-08698

DYNAMIC BEHAVIOR MODEL OF EPHEMERAL STREAM,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-08699

NONEQUILIBRIUM RIVER FORM,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. A. Stevens, D. B. Simons, and E. V. Richardson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY5, Proceedings Paper 11334, p 557-566, May 1975. 9 fig, 13 ref, 1 append.

Descriptors: *Channel morphology, *Channel erosion, *Sedimentation, *River systems, Channels, Erosion, Flood plains, Floods, Floodways, Geomorphology, Meanders, Width, Alluvial channels, Regime, Streamflow, Hydraulics.
Identifiers: *Nonequilibrium river form, Regime theory.

In the absence of man-induced changes and climatic changes and in the engineering time scale, the form of many rivers is primarily a result of the flood history of the river. Evidence of the effects of floods on river channel width is found in the scientific literature. The extreme event flood is the erosional agent that widens the river channels; in some cases the entire river valley has been gutted by the extreme event flood. Succeeding floods of lesser magnitude result in channel deposits that narrow the river channel. The problem is to recognize river systems that are changing form or are susceptible to change in form. If the ratio of each individual flood-peak discharge to the average annual peak-flood discharge is small, the river form can be in equilibrium or 'in regime'. If the ratio of some individual peak discharge to the average annual peak discharge is large, the river channel can exhibit nonequilibrium river form, i.e., the form will change with time. (Lee-ISWS)
W75-08700

MEASUREMENT OF INSTANTANEOUS BOUNDARY SHEAR STRESS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 8G.
W75-08791

WALL SHEAR STRESS MEASUREMENTS WITH HOT-FILM SENSORS,
Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
For primary bibliographic entry see Field 8G.
W75-08792

WAVE REFRACTION ANALYSIS: AID TO INTERPRETATION OF COASTAL HYDRAULICS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08800

PHYSICAL AND BIOLOGICAL REHABILITATION OF A STREAM,
Montana State Univ., Bozeman. Dept. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-08810

SEDIMENT TRANSPORT SYSTEM IN A GRAVEL-BOTTOMED STREAM,
Washington State Dept. of Ecology, Olympia.
R. T. Milhous, and P. C. Klingeman.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 293-303, 1973. 2 fig, 1 tab, 7 ref.

Descriptors: *Sediment transport, *Gravels, *Streams, Suspended solids, Sediment load, Beds, Streambeds, Bed load, Streamflow, Model studies, On-site investigations, Stream erosion, Oregon.
Identifiers: *Armour layers.

The sediment transport system in a coarse-bedded mountain stream in the Oregon Coast Range has been studied for three years. The stream bed is nonhomogenous, with an armour layer of larger particles on top of finer material. A conceptual model of the sediment transport system in an armoured stream was developed to better describe the suspended sediment component of the total transport system. The use of existing bed load calculation procedures for determining the bed load in an armoured stream was examined. It was found that there is an important interaction between the armour layer and the movement of material as bed load and as suspended load. Use of the existing bed load equations is made quite tenuous when an armour layer exists. The armour layer is the single most important factor in limiting the availability of stream bed sediment and in controlling the relationship of streamflow and sediment load in a gravel-bottomed stream. The armour layer controls the sediment transport system by regulating the reservoir of sand and finer particles in the stream bed and by protecting the bed material from entrainment in the flow. At high flows the armour layer controls the rate of release of material to the bed load and suspended load of the stream; at intermediate flows it prevents fine sand in the bed from being entrained in the flow; at low flows it filters out fine material. (See also W75-08786) (Sims-ISWS)
W75-08812

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. F. Ruff, J. W. Keys, III, and M. M. Skinner.

In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 305-313, 1973. 2 fig, 1 ref, 1 append.

Descriptors: *Remote sensing, *Sediments, *Aerial photography, Infrared radiation, Photography, On-site data collections, Erosion, Irrigation, Agriculture, Sedimentology, *Montana. Identifiers: Clarks Fork Yellowstone River(Mont).

In an effort to define sediment problems and their causes in the Clarks Fork Yellowstone River, the 1971 Montana State Legislature established the Clarks Fork Siltation Study Committee. The Clarks Fork Yellowstone River is located in south-central Montana and northwestern Wyoming. The river drains an area of approximately 2783 square miles extending from the northeast cornor of Yellowstone National Park northeastward to its confluence with the Yellowstone River near Laurel, Montana. Aerial reconnaissance of the Clarks Fork Yellowstone River Basin was conducted on September 13, 1972, and covered the main stem of the river and its tributaries in Montana. The ground-truth data program for the aerial remote sensing study of sediment in the river was designed to provide information on flow conditions of the river and its tributaries during the time when remote sensing flights were in progress. The aerial photography for the Clarks Fork Yellowstone River and Red Lodge and Rock Creeks was taken on August 18, 1972. From results of this investigation, the following conclusions were drawn on sediment in the Clarks Fork Yellowstone River: (1) only a small amount of active erosion of surface material is being caused by irrigation; (2) the majority of suspended material being transported by the river is being obtained from the bed and banks of the river and its tributaries; (3) the erodible bed and bank materials were probably deposited in the river as a result of the highly erosive soils of the basin and runoff from high intensity storms of the area; and (4) irrigation return flows contribute to the sediment problems of the river by providing the water to carry the material. (See also W75-08786) (Sims-ISWS)
W75-08813

CHANNEL AGGRADATION IN WESTERN UNITED STATES AS INDICATED BY OBSERVATIONS AT VIGIL NETWORK SITES,
Geological Survey, Boise, Idaho. Water Resources Div.
W. W. Emmett.
Zeitschrift fur Geomorphologie (Federal Republic of Germany), Vol 21, p 52-62, December 1974. 2 fig, 2 tab, 17 ref.

Descriptors: *Sedimentation, *Aggradation, *Alluvial channels, *Geomorphology, Land use, Erosion, Climatology, Alluvium. Identifiers: Western US.

In the semiarid and arid western United States channels at locations ranging from Montana to New Mexico are aggrading. This aggradiation may signify a reversal of the widespread trend of arroyo cutting, which began about A.D. 1880. Observed rates of valley alluviation indicate that valley bottoms would fill to a level of the old valley floor within a period of 200 to 700 years. The data suggest that epicycles of valley trenching and alluviation are related to changes in climate, but these changes in climate may be subtle and difficult to detect. Land use practices may aggravate or enhance naturally occurring rates of geomorphic processes. (Knapp-USGS)
W75-08830

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 2. WATER QUALITY RECORDS.
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 5A.
W75-08833

2K. Chemical Processes

A HIGHLY SENSITIVE AUTOMATED TECHNIQUE FOR THE DETERMINATION OF AMMONIUM NITROGEN,
Ruakura Soil Research Station, Hamilton (New Zealand).
For primary bibliographic entry see Field 5A.
W75-08382

RELATIONSHIP OF VARIOUS INDICES OF WATER QUALITY TO DENITRIFICATION IN SURFACE WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W75-08384

WATER VOL. 39. A YEARBOOK FOR HYDROCHEMISTRY AND WATER PURIFICATION TECHNIQUE,
For primary bibliographic entry see Field 5F.
W75-08390

INDUSTRIAL WATER RESOURCES OF CANADA, THE HUDSON BAY, LABRADOR AND ARCTIC DRAINAGE BASINS, 1959-65,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W75-08395

GEOCHEMISTRY OF GROUNDWATERS IN THE CHAD BASIN,
Geological Survey of Israel, Jerusalem.
A. Arad, and U. Kafri.
Journal of Hydrology, Vol 25, No 1/2, p 105-127, April 1975. 11 fig, 2 tab, 8 ref.

Descriptors: *Geochemistry, *Salinity, *Groundwater movement, Lake basins, Structural geology, Drainage, Aquifers, Unconfined aquifers, Water table, Potentiometric level, Chemical analysis, Bicarbonates, Sulfates, Sodium chloride, Cation exchange, Calcium, Magnesium, Geologic control, Underflow, Chemicals. Identifiers: *Chad Basin, *Lake Chad.

The prevailing chemical patterns of groundwater in the Chad Basin coincide with its present hydrodynamics. The geochemistry of these waters indicates that their salinity is of non-marine origin and is the result of thorough flushing downgradient of the basinfill sediments, mainly of continental origin. The hydrochemical evolutionary trend is from calcium-bicarbonate isotopically light waters in the intake area in the south and southwestern fringe of the basin toward progressively distinct chemical groups to the northeast. (Visocky-ISWS)
W75-08445

THE NA'AMAN SPRINGS, NORTHERN ISRAEL: SALINATION MECHANISM OF AN IRREGULAR FRESHWATER-SEAWATER INTERFACE,
Geological Survey of Israel, Jerusalem. Hydrogeology Div.
For primary bibliographic entry see Field 2L.
W75-08446

POLYNUCLEAR AROMATIC HYDROCARBONS IN RAW, POTABLE AND WASTE WATER,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 5A.
W75-08453

A SIMPLE RESPIROMETER FOR MEASURING OXYGEN AND NITRATE CONSUMPTION IN BACTERIAL CULTURES,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W75-08458

REDOX PROCESSES IN DIAGENESIS OF SEDIMENTS IN THE NORTHWEST PACIFIC OCEAN,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov, A. G. Rozanov, and V. S. Sokolov.
Soil Science, Vol 119, No 1, p 28-35, January 1975. 3 fig, 20 ref.

Descriptors: *Diagenesis, *Sediments, *Pacific Ocean, *Decomposing organic matter, *Geochemistry, Bottom sediments, Physiocochemical properties, Cores, Manganese, Sulfur, Iron.
Identifiers: *Redox processes.

Redox processes are quite widespread in bottom sediments of modern water bodies. Decomposition of organic matter in the mass of sediments, taking place as a result of micro-biological and chemical processes, changes the physicochemical conditions, thereby bringing about a decrease in the redox potential of pore liquids. Under the reducing conditions created by the decomposition of organic material, the valencies, forms, and geochemical mobility of compounds of certain elements become changed. A possibility is thus created for the redistribution and concentration of certain elements in bottom sediment. Based on geochemical measurements in some 27 sediment cores collected from bottom sediments in the northwest section of the Pacific Ocean, information on the forms of iron, manganese, and sulfur, as well as organic carbon, was given. The sediments studied can be divided into three major categories: (1) reduced sediments of the continental slope; (2) transitional sediments of the marginal oceanic zone; and (3) pelagic sediments of the open ocean (red oozes). Apart from data on the areal distribution of the geochemical factors measured, profiles of element distribution versus depth of sediment core were given. (Sanderson-ISWS)
W75-08463

NITRATE AND NITRITE REDUCTION IN FLOODED GAMMA-IRRADIATED SOIL UNDER CONTROLLED PH AND REDOX POTENTIAL CONDITIONS,
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
For primary bibliographic entry see Field 5G.
W75-08470

SPECTRAL STUDIES OF MONILIFORMIN AND AFLATOXIN B1,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-08475

ANALYSES OF SELECTED CONSTITUENTS IN NATIVE WATER AND SOIL IN THE BAYOU BOEUF-CHENE-BLACK AREA NEAR MORGAN CITY, LOUISIANA, INCLUDING A MODIFIED STANDARD ELUTRIATE TEST,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-08501

CHEMISTRY OF SUBSURFACE WATERS,
Geological Survey, Menlo Park, Calif.
I. Barnes, and J. D. Hem.
Annual Review of Earth and Planetary Sciences, Vol 1, F. A. Donath, editor: Annual Reviews Inc., Palo Alto, Calif, p 157-181, 1973. 178 ref.

Descriptors: *Water chemistry, *Groundwater, *Reviews, Hydrogeology, Geochemistry, Subsurface waters, Bibliographies, Soil water, Connate water, Magmatic water.

This review concentrates on processes and reactions that control compositions of groundwaters because causal relations have greater transfer value than mere reports of compositions. A four part classification of waters is used: (1) waters not noteworthy for either their temperatures or their compositions; (2) waters noted for both their temperatures and their compositions; (3) waters noted primarily for their temperatures; and (4) waters noted primarily for their compositions. (Knapp-USGS)
W75-08506

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE CHERRYFIELD-JONESBORO AREA, MAINE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08510

WATER RESOURCES OF THE CROW RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08511

RECONNAISSANCE OF THE UPPER AU SABLE RIVER, A COLD-WATER RIVER IN THE NORTH-CENTRAL PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08512

WATER RESOURCES OF THE BLUE EARTH RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08513

WATER RESOURCES OF THE CLINTON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08514

CHEMICAL QUALITY OF GROUND WATER IN THE WESTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5B.
W75-08515

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7A.
W75-08519

WATER QUALITY OF THE LAKE SISKIYOU AREA AND A REACH OF UPPER SACRAMENTO RIVER BELOW BOX CANYON DAM, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-08521

NON-FLAME ATOMIZATION IN ATOMIC ABSORPTION SPECTROMETRY,
Auckland Univ. (New Zealand). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.

W75-08529

STANDARDIZATION OF METHODS FOR THE DETERMINATION OF TRACES OF MERCURY -- PART I. DETERMINATION OF TOTAL INORGANIC MERCURY IN INORGANIC SAMPLES.
Bureau International Technique du Chlore, Brussels (Belgium). Mercury Analysis Working Party.
For primary bibliographic entry see Field 5A.
W75-08530

SOME OBSERVATIONS ON THE DETERMINATION OF COPPER WITH THIOCYANATE,
Loughborough Univ. of Technology (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-08532

DETERMINATION OF NANOGRAM QUANTITIES OF MERCURY IN SEA WATER,
Marine Research Inst., Reykjavik (Iceland).
For primary bibliographic entry see Field 5A.
W75-08535

SPECTROPHOTOMETRIC DETERMINATION OF TUNGSTEN IN ROCKS BY AN ISOTOPE DILUTION PROCEDURE,
Geological Survey, Washington, D.C.
E. G. Lillie, and L. P. Greenland.
Journal of Research of the U.S. Geological Survey, Vol 1, No 5, p 555-558, September-October, 1973. 3 tab, 8 ref.

Descriptors: *Metals, *Analytical techniques, *Spectroscopy, *Rocks, Chemical reactions, Tracers, Radioisotopes, Separation techniques.
Identifiers: *Tungsten.

A method for the determination of tungsten which gives a reliable tungsten thiocyanate color owing to the prior separation from most other sample constituents was described. Samples were decomposed with hydrofluoric acid in the presence of W181 tracer. Molybdenum was extracted from a hydrochloric acid solution with tributyl phosphates. Tungsten was separated from most other elements by extraction of the alpha-benzoinoximate into chloroform. Stannous chloride in concentrated hydrochloric acid was used to strip tungsten and reduce it to W(+5). The amount of tungsten was determined spectrophotometrically after extraction as the thiocyanate complex into amyl alcohol. The correction for chemical losses was determined by counting W181. (Jernigan-Vanderbilt)
W75-08536

DETERMINATION OF SELENIUM IN WATER AND INDUSTRIAL EFFLUENTS BY FLAMELESS ATOMIC ABSORPTION,
Calgon Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W75-08541

SPECTROPHOTOMETRIC DETERMINATION OF DISSOLVED OXYGEN CONCENTRATION IN WATER,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W75-08551

SINGLE-SWEEP POLAROGRAPHIC TECHNIQUES USEFUL IN MICROPOLLUTION STUDIES OF GROUND AND SURFACE WATERS,
Naval Weapons Center, China Lake, Calif.
For primary bibliographic entry see Field 5A.
W75-08554

THE USE OF MEMBRANE ELECTRODES IN THE DETERMINATION OF SULPHIDES IN SEA WATER,
For primary bibliographic entry see Field 5A.
W75-08558

DETERMINATION OF NITRATE IN WATER WITH AN AMMONIA PROBE,
Brussels Univ. (Belgium). Laboratorium Analytische Chemie.
For primary bibliographic entry see Field 5A.
W75-08561

ZETA-POTENTIAL CONTROL FOR ALUM COAGULATION,
Fertilizer Corp. of India, Sindri.
For primary bibliographic entry see Field 5F.
W75-08565

KRAMERS-KRONIG ANALYSIS OF RATIO REFLECTANCE SPECTRA MEASURED AT AN OBLIQUE ANGLE,
Missouri Univ., Kansas City. Dept. of Physics.
For primary bibliographic entry see Field 1A.
W75-08601

WATER TURBIDITY MEASURING APPARATUS,
Fishmaster Products, Inc., Tulsa, Okla. (assignee)
For primary bibliographic entry see Field 7B.
W75-08626

QUANTITATIVE DETERMINATION OF FREON 12 AND FREON 22 IN WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W75-08682

CARBON 14 DATING OF GROUNDWATER FROM CLOSED AND OPEN SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W75-08707

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURE,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 7B.
W75-08760

QUALITY OF PUBLIC WATER SUPPLIES OF NEW YORK, MAY 1972-MAY 1973.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5A.
W75-08832

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 2. WATER QUALITY RECORDS.
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 5A.
W75-08833

STREAM RECONNAISSANCE FOR NUTRIENTS AND OTHER WATER-QUALITY PARAMETERS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Carnegie, Pa.
For primary bibliographic entry see Field 5A.
W75-08835

2L. Estuaries

THE RESPONSE OF MASSACHUSETTS BAY TO WIND STRESS,
Massachusetts Inst. of Tech., Cambridge.
B. B. Parker, and B. R. Pearce.
Report No MITSG 75-2, February 1975. 107 p, 21 fig, 5 tab, 48 ref. NOAA Grant 04-5-158-1.

Descriptors: *Winds, *Wind pressure, *Tides, Wind velocity, Transportation, Pollutants, Sea level, Storm surges, Waves, Atmospheric physics, Atmosphere, Massachusetts, Thermal stratification, Bays.
Identifiers: *Wind stress, *Quadratic law, *Transport mechanisms, *Massachusetts Bay(Mass), Boston(Mass), 'Wind set-up' method, Filtered tidal records.

The effect of atmospheric stability on the wind stress coefficient (or drag coefficient), (CD), of the commonly used quadratic law is demonstrated. The method of determining values for CD is essentially a 'wind set-up' method using Doodson filtered tidal records from Boston and Sandwich, Massachusetts and similarly filtered wind and barometric pressure data. The mean values for CD for the three stability groups are: 1.10x10-3 for stable conditions, 1.40x10-3 for neutral conditions, and 1.84x10-3 for unstable conditions. Correlation exists not only between Boston-Sandwich sea level differences and the component of wind stress along the longitudinal axis of the bay, but also between Boston-Portsmouth sea level differences and the onshore component of wind stress. Analyzing Boston, Sandwich, Portsmouth, and Eastport, Maine tidal records results in very similar non-tidal sea level curves even after pressure correction. This implies that the Gulf of Maine has been an important effect on Massachusetts Bay. Wind data at Boston is used for this study but it is corrected for the frictional effect of land using the result of comparisons with other wind stations around the bay. Wind stress was generally much greater in the winter of 1971 than in the summer, not only because of generally higher wind speeds, but also because of greater atmospheric instability and denser air. Current data off Salem harbor indicate the existence of internal waves. (NOAA)
W75-08358

THREE NEW SPECIES OF PARACINETA (PROTOZOA: SUCTORIA) FROM MOBILE BAY, ALABAMA,
University of South Alabama, Mobile. Dept. of Biological Sciences.
E. E. Jones.
Journal Marine Science Alabama, (1973), Vol 2, No 3, p 31-40, 6 fig, 1 tab, 9 ref. OWRT A-021-ALA(3).

Descriptors: Bays, *Protozoa, Estuaries, Surveys, *Alabama.
Identifiers: New species, *Suctoria, *Mobile Bay(Ala), *Paracineta spp.

Substrates (microscope slides) were immersed in Mobile Bay for a one-week period. They were stained with Grenacher's Borax Carmine and Lyon's Blue. This technique has been used monthly for the past two years to study the protozoa of the Bay. Three new species of suctoria, Paracineta lineata n. sp., P. meridionalis n. sp., and P. estuarina n. sp., are described.
W75-08363

NEW SPECIES OF PROTOZOA FROM MOBILE BAY, ALABAMA,
University of South Alabama, Mobile. Dept. of Biological Sciences.
E. E. Jones, and G. Owen.
Journal Marine Science Alabama, (1973), Vol 2, No 3, p 41-56, 15 fig, 1 chart, 19 ref. OWRT A-021-ALA(4).

Descriptors: Bays, *Protozoa, Estuaries, Surveys, *Alabama, Systematics, Salinity.
Identifiers: New species, *Mobile Bay(Ala).

Mobile Bay is the third largest drainage basin in the country. Salt water from the Gulf of Mexico enters the moutn of the bay and flows upward along the eastern shore where it mixes with the fresh water from the nine rivers which drain into the bay. The flow pattern is counter-clockwise so that the water along the western shore is less saline than that of the eastern shore. More than two hundred and fifty free-living species of protozoa have been identified in the bay. Four new and undescribed species were collected there: Cienkowskya arborenscens n. sp., Stephanopogon mobilensis n. sp., S. colpoda Entz, 1884, var., and Microgromia biportalis n. sp.
W75-08364

SEAWEEDS: THEIR PRODUCTIVITY AND STRATEGY FOR GROWTH,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-08377

REDESCRIPTION OF GAETANUS INTERMEDIUS CAMPBELL (CALANOIDA: COPEPODA) FROM THE TYPE LOCALITY,
Washington Univ., Friday Harbor. Friday Harbor Lab.
T. Park.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1597-1600, October 1973. 2 fig, 6 ref.

Descriptors: *Systematics, *Copepods, Speciation, Pacific Ocean.
Identifiers: *Gaetanus intermedius, Vancouver Island, Washington Sound.

Gaetanus intermedius Campbell 1930, is redescribed from specimens taken in the type locality, the Vancouver Island region in the northeastern Pacific. Gaetanus simplex Brodsky 1950, is found to be a junior synonym of G. intermedius. (Little-Battelle)
W75-08380

A SCHEMATIZATION OF ONSHORE-OFFSHORE TRANSPORT,
Waterloopkundig Laboratorium, Delft (Netherlands).
D. H. Swart.
Publication 134, September 1974. 17 p, 12 fig, 10 ref.

Descriptors: *Beaches, *Waves(Water), *Equilibrium, *Profiles, *Sediment transport, *Coasts, Laboratory tests, Model studies, Particle size, Equations, Hydraulics.
Identifiers: *Onshore-offshore transport, Deepwater waves.

The results of a physically-based schematic model of the onshore-offshore profile development on small scale and full scale model tests were described. The investigation covered two aspects of the schematization of coastal processes on sandy beaches in a direction perpendicular to the coastline: (1) the prediction of equilibrium beach profiles and (2) the corresponding offshore sediment transport due to wave action. Physically-based empirical relationships were derived to enable the application of the model results to both small-scale and prototype conditions. It was concluded that the proposed equilibrium profile is effected by particle diameter and absolute value of deepwater wave heights. It was also shown that the rate of offshore transport under three-dimensional conditions was higher than under corresponding two-dimensional conditions. (Bhowmik-ISWS)
W75-08401

EQUILIBRIUM PROFILES OF COARSE MATERIAL UNDER WAVE ATTACK,
Waterloopkundig Laboratorium, Delft (Netherlands).
E. van Hijum.
Publication 133, September 1974. 19 p, 19 fig, 3 tab, 7 ref.

Descriptors: *Beaches, *Waves(Water), *Gravels, *Equilibrium, *Profiles, Band protection, Sediment transport, Laboratory tests, Scaling, Froude number, Model studies, Hydraulics.
Identifiers: *Progressive waves, Wave run-up, Critical velocity.

The results of a laboratory investigation of equilibrium beach profiles under wave attack were presented. The beach materials were composed of gravels and rubbles. The aim of the study was to determine the dimensions, form, and way of formation of an equilibrium profile under regular, perpendicular wave attack. It was concluded that gravel with D sub 90 sizes less than 0.006 meter is sensitive to scale effects. (Bhowmik-ISWS)
W75-08402

SIZE SPECTRA OF BIOGENIC PARTICLES IN OCEAN WATER AND SEDIMENTS,
Physical Research Lab., Ahmedabad (India).
For primary bibliographic entry see Field 2J.
W75-08424

ACOUSTIC MINIPROBING FOR OCEAN MICROSTRUCTURE AND BUBBLES,
Naval Postgraduate School, Monterey, Calif. Dept. of Physics and Chemistry.
H. Medwin, J. Fitzgerald, and G. Rautmann.
Journal of Geophysical Research, Vol 80, No 3, p 405-413, January 20, 1975. 11 fig, 2 tab, 15 ref.

Descriptors: *Oceans, *Bubbles, *Acoustics, On-site data collections, Instrumentation, Measurement, Sound waves, Hydrophones, Oceanography, Statistics.
Identifiers: *Ocean microstructure, Sound speed.

Analysis of sound phase and amplitude fluctuations over a 1-m range has provided in situ statistics that can be used to infer the statistics of the ocean microstructure. A particularly fruitful use of such a simple acoustic miniprobe is the study of the sound phase fluctuations near the sea surface. With the aid of simultaneous statistics of temperature and wave height the observed sound phase fluctuations were used to calculate bubble statistics at sea. At sound frequencies less than about 25 kHz the sound speed dispersion and its fluctuations reveal the bubble volume fraction and its standard deviation, respectively. At higher sound frequencies a large resonant bubble population can be identified by a cross correlation of sound phase and ocean wave height. In this case the predominant part of the sound phase modulation is caused by the changing bubble radius due to the fluctuating wave height. The spectrum of the sound phase modulation then mimics the ocean wind wave spectrum, and its change with depth can be used to infer the change of number of resonant bubbles with depth. (Sims-ISWS)
W75-08425

MAXIMUM HEIGHTS OF OCEAN WAVES,
MPR Associates, Inc., Washington, D.C.
F. Sellars.
Journal of Geophysical Research, Vol 80, No 3, p 398-404, January 20, 1975. 5 fig, 3 tab, 22 ref, 1 append.

Descriptors: *Ocean waves, *Height, Waves(Water), Standing waves, Wavelengths, Winds, Laboratory tests, Model studies, On-site investigations, *Atlantic Ocean, Oceanography.
Identifiers: *Wave steepness, Irregular waves, Wave spectra, Traveling waves, Breaking waves.

Laboratory and field measurements of maximum wave amplitudes of irregular waves were reported. Few measurements of maximum irregular wave heights have been available previously, and the results in this paper will aid in evaluating limiting wave proportions. The data cover observations of breaking waves in a laboratory irregular wave system and results for the largest waves in field observations for severe weather conditions in the North Atlantic. The data were compared with theoretical predictions based on the assumption that wave breaking is the predominant factor limiting wave height. These results may be used to estimate maximum wave conditions for design purposes when field data for maximum wave conditions are not available. Differences in wave spectra for equilibrium wave conditions were investigated, and it was concluded that the proportion of breaking waves in an irregular wave record explains the variations observed. (Sims-ISWS)
W75-08426

EXTREME WAVE CONDITIONS DURING HURRICANE CAMILLE,
Naval Oceanographic Office, Washington, D.C.
M. D. Earle.
Journal of Geophysical Research, Vol 80, No 3, p 377-379, January 20, 1975. 3 fig, 2 tab, 7 ref.

Descriptors: *Waves(Water), *Hurricanes, *Frequency, *Height, Ocean waves, Wavelengths, Storms, Winds, Gulf of Mexico, Offshore platforms, On-site investigations, Measurement, Oceanography, Meteorology.
Identifiers: *Hurricane Camille.

Ten hours of wave data recorded from a fixed platform during hurricane Camille were analyzed to determine wave heights and periods. Wave conditions were severe with a maximum measured wave height of 23.6 m. The analysis results indicate that a Rayleigh distribution can be used to compute wave height relationships for large hurricane-generated waves. (Sims-ISWS)
W75-08427

EVOLUTION OF GULF STREAM EDDIES AS SEEN IN SATELLITE INFRARED IMAGERY,
National Environmental Satellite Service, Washington, D.C.
H. G. Stumpf, and P. K. Rao.
Journal of Physical Oceanography, Vol 5, No 2, p 388-393, April 1975. 5 fig, 9 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Eddies, *Meanders, *Atlantic Ocean, Infrared radiation, Ocean circulation, Ocean currents, Oceanography.
Identifiers: *Gulf Stream.

Pronounced eddies along the western edge of the Gulf Stream were again observed by the Very High Resolution Radiometer aboard the NOAA-2 satellite. A rare sequence of infrared images obtained over a period of seven days shows for the first time the complete evolution of meanders through the eddy stage. (Sims-ISWS)
W75-08429

SATELLITE DETECTION OF UPWELLING IN THE GULF OF TEHUANTEPEC, MEXICO,
National Environmental Satellite Service, Washington, D.C.
H. G. Stumpf.
Journal of Physical Oceanography, Vol 5, No 2, p 383-388, April 1975. 4 fig, 4 ref.

Descriptors: *Remote sensing, *Satellites(Artificial), *Upwelling, Pacific Ocean, *Mexico, Infrared radiation, Ocean circulation, Meteorology, Oceanography, Ocean currents.
Identifiers: *Gulf of Tehuantepec(Mex), Gyres.

The daily acquisition of thermal infrared imagery from the NOAA-2 satellite permitted the delinea-

tion and monitoring of a series of upwellings in the Gulf of Tehuantepec during December 1973. Following the upwelling, a large anticyclonic gyre was detected in the imagery as the coastal currents returned to their historical positions. (Sims-ISWS)
W75-08430

THE BERING SLOPE CURRENT SYSTEM,
Washington Univ., Seattle. Dept. of Oceanography.
T. H. Kinder, L. K. Coachman, and J. A. Galt.
Journal of Physical Oceanography, Vol 5, No 2, p 231-244, April 1975. 18 fig, 1 tab, 18 ref. NSF Grant GA 11147 A 3.

Descriptors: *Ocean currents, *Continental slope, *Temperature, *Salinity, Continental shelf, On-site investigations, Ocean circulation, Ships, Surveys, Eddies, Topography, Oceanography.
Identifiers: *Bering Sea, Drogues, Geostrophic calculations, Planetary waves.

The Bering Slope Current flows from southeast to northwest across the Aleutian Basin of the Bering Sea, parallel to the continental slope of the eastern Bering Sea shelf. The water mass characteristics and distributions and the flow field were investigated in August 1972 during T.G. Thompson Cruise 071. Water mass analysis revealed a southeast-flowing countercurrent bounded by two northwest-flowing bands. The countercurrent was clearly delineated by analyses of a temperature-minimum layer between approximately 50-300 m and a temperature-maximum layer between approximately 300-800 m. The description of the current as comprised of three bands was supported by parachute drogue measurements and geostrophic calculations along six salinity-temperature-depth sections normal to the slope. The dynamic topographies showed an alternative description of the current as a system of eddies, and an interpretation based on incident and reflected planetary waves with a period of one year was presented. The generating mechanism may be related to the strong annual variation in Bering Sea weather. (Sims-ISWS)
W75-08431

THE NA'AMAN SPRINGS, NORTHERN ISRAEL: SALINATION MECHANISM OF AN IRREGULAR FRESHWATER-SEAWATER INTERFACE,
Geological Survey of Israel, Jerusalem. Hydrogeology Div.
A. Arad, U. Kafri, and E. Fleisher.
Journal of Hydrology, Vol 25, No 1/2, p 81-104, April 1975. 10 fig, 5 tab, 18 ref.

Descriptors: *Springs, *Saline water-freshwater interfaces, *Saline water intrusion, Salinity, Geologic control, Faults(Geologic), Water pollution, Brackish water, Watersheds(Basins), Aquifers, Structural geology, Karst hydrology, Limestones, Dolomite, Groundwater movement, Chemical analysis, Geochemistry, Radioisotopes, Oxygen isotopes.
Identifiers: *Israel(Na'aman Springs), Judea Group, Horst, Graben, Ratios.

In the Na'aman catchment area, the water in the Judea Group aquifer varies from freshwater to dilute seawater. It was previously assumed that high salinities in this area were due to fossil brackish water or connate seawater. However, the chemical composition of the water indicates contamination by present seawater. The irregular distribution of high salinities along the main E-W faults in the area points to the possibility that these faults are the main conduit for active contamination of the aquifer by seawater. (Visocky-ISWS)
W75-08446

SALINE GROUND-WATER RESOURCES OF LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.

W75-08517

ENVIRONMENTAL REQUIREMENTS OF SELECTED ESTUARINE CILIATED PROTOZOA,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-08592

PHYSICAL CRITERIA IN COMPUTER METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS,
Rutgers - the State Univ., New Brunswick, N.J. Dept. of Computer Science.
For primary bibliographic entry see Field 5G.
W75-08593

STATUTORY DEFINITIONS OF FRESHWATER WETLANDS.
For primary bibliographic entry see Field 6E.
W75-08594

MODULAR EROSION CONTROL DEVICE,
For primary bibliographic entry see Field 8A.
W75-08611

NORMAL MODES OF THE ATLANTIC AND INDIAN OCEANS,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
G. W. Platzman.
Journal of Physical Oceanography, Vol 5, No 2, p 201-221, April 1975. 11 fig, 6 tab, 23 ref, 2 append. NSF Grant GA-15995.

Descriptors: Oceans, *Resonance, *Tides, Water level fluctuations, Ocean circulation, Oceanography, Model studies, Computer models, *Atlantic Ocean, *Indian Ocean, Coriolis force, Energy transfer, Hydrodynamics.
Identifiers: Modes, Oscillations, Gravity modes, Rotational modes.

Normal modes were calculated for a homogeneous ocean occupying a connected domain consisting of the North Atlantic, South Atlantic, and Indian Oceans. Coastal configuration and bathymetry were resolved on a grid of 675 six-degree Mercator squares. The calculation was based upon the Lanczos process and was more efficient than resonance iteration. Twenty-six gravity modes were found with periods greater than 8 h, the slowest being a fundamental mode of about 67 h. The North Atlantic co-oscillates with the South Atlantic at a period of about 42 h, and has strong resonances at 23, 21, 14.4, 12.8, 8.6, and 8.3 h. Eleven topographically-induced modes of rotational type were found with periods less than 100 h; the fastest of these is a 44 h mode in the Weddell Sea. In the 6-degree model the fastest rotational mode of the North Atlantic is a 55 h topographic wave most prominent near the Grand Banks of Newfoundland. (Sims-ISWS)
W75-08686

TIDAL CHARTS OF THE CENTRAL PACIFIC OCEAN,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
D. S. Luther, and C. Wunsch.
Journal of Physical Oceanography, Vol 5, No 2, p 222-230, April 1975. 11 fig, 2 tab, 26 ref. NSF Grant GA 32979.

Descriptors: *Tides, *Pacific Ocean, *Charts, Oceans, Oceanography, Water level fluctuations, Time series analysis.
Identifiers: Cotidal charts, Co-amplitude charts, Modes, Amphidromes.

New co-amplitude and cotidal charts of the central Pacific Ocean were constructed for constituents M

sub 2, S sub 2, N sub 2, K sub 1 and 0 sub 1. The charts exhibit some significant differences from previous attempts. Admittance curves, calculated where possible, do not show any rapidly varying characteristics in contrast to the North Atlantic. (Sims-ISWS)
W75-08687

SOME PROPERTIES OF THE WARM EDDIES GENERATED IN THE CONFLUENCE ZONE OF THE KUROSHIO AND OYASHIO CURRENTS,
Hokkaido Regional Fisheries Research Lab., Yoichi (Japan).
K. Kitano.
Journal of Physical Oceanography, Vol 5, No 2, p 245-252, April 1975. 11 fig, 1 tab, 19 ref.

Descriptors: *Ocean currents, *Eddies, Temperature, Currents(Water), On-site investigations, Oceanography, Isotherms, Mapping, *Pacific Ocean, *Water temperature.
Identifiers: *Warm eddies, Fronts(Oceanic), Japan.

The size, movement, and maximum core temperature of warm eddies off Japan were discussed on the basis of 154 examples of warm eddies from various sources during the 17 year period 1957-1973. The warm eddies generated in the confluence zone of the Kuroshio and the Oyashio Currents are distributed in a rather restricted area of the sea and have an elliptical form with an average diameter of about 70 n mi. The eddies usually move to north or northeast with speeds of 0.3-2.0 n mi/day along the contours of the continental slope. As the eddies move north their size and the maximum core temperature gradually decrease. (Sims-ISWS)
W75-08688

MICROSTRUCTURE AND INTRUSIONS IN THE CALIFORNIA CURRENT,
Scripps Institution of Oceanography, La Jolla, Calif.
M. C. Gregg.
Journal of Physical Oceanography, Vol 5, No 2, p 253-278, April 1975. 21 fig, 3 tab, 21 ref. ONR Contracts N00014-69-A-0200-6049, N00014-69-A-0200-6039.

Descriptors: *Ocean currents, Temperature, *Salinity, Density, Profiles, Oceanography, Currents(Water), Pacific Ocean, Sounding, On-site data collections, California, *Water temperature.
Identifiers: Microstructure, *Intrusions(Oceanic), Cox number, Potential density, *Baja California, *California Current.

Two microstructure records taken at shallow depths off Cabo San Lucas, at the southern tip of Baja California, were compared. One was similar to records previously taken in the mid-gyre, and had an 'irregularly steppy' appearance, a linear T-S relation, and a Cox number of approximately 10. It was suggested that this type of profile may represent the background condition of the ocean in which the levels of vertical turbulence are quite low and the principal dissipation occurs by small-scale shear instabilities at the 'step' structures. The other record exhibited a very irregular T-S relation, due to multiple interleavings of the water masses present in the area. Coupled with this was an average Cox number of at least 6000 and a much greater variability in the local microstructure levels along the record; half-meter averages of the dissipation rate of temperature fluctuations showed a range greater than 1,000,000. In some cases these differences occurred over vertical separations of a few meters. In general, the regions of intense microstructure activity occur at the vertical boundaries of the intrusions and seem to be the result of shears and double diffuse phenomena associated with the spreading motion of the intrusion and the vertical T-S differences. These processes act to dissipate the intrusion as an identifiable feature. The presence of similar intru-

sive features in other locations suggests that they are major factors in the dissipation of fluctuations in the ocean, but microstructure profiles, by themselves, are not sufficient to assess the vertical heat flux associated with them. (Sims-ISWS)
W75-08689

INTERNAL WAVE REFLECTION BY A VELOCITY SHEAR AND DENSITY ANOMALY,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
For primary bibliographic entry see Field 2E.
W75-08690

A NUMERICAL STUDY OF TIME-DEPENDENT TURBULENT EKMAN LAYERS OVER HORIZONTAL AND SLOPING BOTTOMS,
Florida State Univ., Tallahassee. Dept. of Oceanography, and Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.
For primary bibliographic entry see Field 2E.
W75-08691

COASTAL TRAPPED WAVES IN A BAROCLINIC OCEAN,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
D-P. Wang.
Journal of Physical Oceanography, Vol 5, No 2, p 326-333, April 1975. 6 fig, 27 ref, 1 append. CUEA GX 33052: ONR N00014-67-A-0201-0013.

Descriptors: *Ocean waves, *Coasts, *Continental shelf, Internal waves, Waves(Water), Model studies, Mathematical models, Channeling, Stratification, Oceans, Oceanography.
Identifiers: *Trapped waves, Baroclinic oceans, Internal Kelvin waves.

Coastal-trapped waves were studied in a two-layered, non-flat shelf model. Internal Kelvin wave and quasi-geostrophic waves appear as eigenmodes of the system. The latter reduce to the familiar barotropic shelf waves only in the limit of vanishing stratification. With strong stratification, i.e., where the internal Kelvin wave phase speed is larger than the phase speed of the quasi-geostrophic wave, quasi-geostrophic waves are bottom-trapped. Resonant coupling occurs when the two types of waves have compatible phase speeds; in this case, the relative amplitude distribution of the resonant modes is very sensitive to the change of the baroclinic radius of deformation. Implications of this work for the study of shelf water response to external disturbances were briefly discussed. (Sims-ISWS)
W75-08692

THE INFLUENCE OF LONGITUDINAL VARIATIONS IN WIND STRESS CURL ON THE STEADY OCEAN CIRCULATION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2E.
W75-08693

TRAJECTORIES AND SPEEDS OF WIND-DRIVEN CURRENTS NEAR THE COAST,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2H.
W75-08694

THE EFFECT OF WIND AND SURFACE CURRENTS ON DRIFTERS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2H.
W75-08695

DYNAMIC HEIGHT FROM TEMPERATURE PROFILES,
Hawaii Univ., Honolulu. Dept. of Oceanography.
For primary bibliographic entry see Field 2E.
W75-08696

CIRCULATION IN CENTRAL LONG ISLAND SOUND,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
R. B. Gordon, and C. C. Pilbeam.
Journal of Geophysical Research, Vol 80, No 3, p 414-422, January 20, 1975. 11 fig, 2 tab, 12 ref.

Descriptors: *Sounds, *Currents(Water), *Water circulation, *On-site investigations, Tidal effects, Streamflow, Wind tides, Rainfall, River flow, Saline water-freshwater interfaces, Salinity, Convection, Gravity, Tides, Tidal waters, On-site data collections, Density currents, Estuaries, Flow measurement, *Connecticut, Evaluation.
Identifiers: *Long Island Sound(Conn).

Current meter records from 28 stations were used to define the flow of water near the bottom of central Long Island Sound. Records were made at two of the stations for over 1 year and for 10 days or more at most of the others. Tidal and nontidal flow components were separated. Random fluctuations of up to 10 day's duration occur in the non-tidal flow; they are not directly influenced by wind, rainfall, river runoff, or variations in sea level along the shore. Salinity observations showed the presence of well-defined surface and bottom water layers. Mixing between these is confined to shore side zones where the water is less than 10 m deep and to shoals where strong turbulence is generated. The current meter data showed the bottom water at depths greater than 20 m to be flowing upstream at a rate that decreases toward the head of the estuary. At depths less than 20 m there is a shoreward flow of bottom water toward the mixing zone. The salinity and current data were used to construct a circulation model for the sound. The large-scale flow is apparently due to gravitational convection associated with salinity differences. However, response to changes in the freshwater inflow is delayed by about 2 months because of the large volume of surface water relative to the freshwater supply. (Dawes-ISWS)
W75-08702

THE TIDAL ENERGETICS OF NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. R. Levine, and K. E. Kenyon.
Journal of Geophysical Research, Vol 80, No 12, p 1683-1688, April 20, 1975. 3 fig, 16 ref. EPA Grant WP-252-02.

Descriptors: *Tidal energy, *Energy budget, *Energy dissipation, Estuaries, Tidal waters, Tidal effects, Energy loss, Energy gradient, Tides, Height, *Rhode Island, Bays.
Identifiers: *Tidal dissipation, Stratified estuary, *Narragansett Bay(RI), Tidal currents, Energy sink, Vertical mixing.

The average tidal energy budget of Narragansett Bay, a weakly stratified estuary, was determined from observations of tidal height and current. For average conditions the tidal energy influx to the bay is balanced by the bay's energy sinks, and within the error limits the energy budget balances completely. The average energy inputs to the three bay channels, the West Passage, the East Passage, and the Sakonnet River, are 4.3, 6.4, and 1.1 x 10 to the 13th power ergs/s, respectively. Tidal energy is dissipated on the bottom of the bay at the average rate of 8.8 x 10 to the 13th power ergs/s, mostly in a few localized areas of high dissipation. The bay does work on the moon at an average rate of 1.8 x 10 to the 13th power ergs/s. The energy required for vertical mixing is 0.3 x 10 to the 13th power ergs/s. Phase adjustment between tidal

height and current was suggested as a mechanism contributing to the instantaneous balance of the tidal energy budget over the lunar cycle. (Lee-ISWS)
W75-08705

PROPAGATION OF TIDAL WAVES IN THE JOSEPH BONAPARTE GULF,
Wollongong Univ., Coll. (Australia). Dept. of Mathematics.
J. P. Louis, and J. R. M. Radok.
Journal of Geophysical Research, Vol 80, No 12, p 1689-1690, April 20, 1975. 3 fig, 8 ref.

Descriptors: *Tidal bores, *Tidal waters, *Surges, *Water circulation, *Ocean waves, Waves(Water), Gulfs, *Australia, Estuaries, Ocean currents, Model studies, Bays.
Identifiers: Tidal waves, Wave propagation, *Joseph Bonaparte Gulf(Australia), Tidal phase, Phase angles, Semidiurnal tides, Circular gulf model.

It was conjectured that tidal phase lags around large bays and gulfs can be explained in terms of simple harmonic shelf waves propagating around a constant depth circular region. The Joseph Bonaparte Gulf was considered as an example, and the observed phase trends were shown to be well correlated with those predicted for a circular gulf with a radius of 190 km and a depth of 80 m. (Lee-ISWS)
W75-08706

DREDGED SPOIL DISPOSAL ON THE NEW JERSEY WETLANDS: THE PROBLEM OF ENVIRONMENTAL IMPACT ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N.J. Marine Science Center.
For primary bibliographic entry see Field 5C.
W75-08716

THE DETERMINATION OF CURRENT VELOCITIES FROM DIFFUSION/ADVECTION PROCESSES IN THE IRISH SEA,
University Coll. of North Wales, Bangor. Dept. of Physical Oceanography.
For primary bibliographic entry see Field 2E.
W75-08717

COASTAL POWER PLANT HEAT DISPOSAL CONSIDERATIONS,
Southern California Edison Co., Rosemead, Calif.
For primary bibliographic entry see Field 5G.
W75-08719

FLOATING BREAKWATER,
Bridgestone Tire Co. Ltd., Tokyo (Japan). (assignee)
For primary bibliographic entry see Field 8B.
W75-08746

FLOATING BREAKWATER SYSTEM,
Reid, Middleton and Associates, Inc., Edmonds, Wash. (Assignee).
For primary bibliographic entry see Field 8B.
W75-08756

ON ENVIRONMENTAL FACTORS AFFECTING THE PRIMARY PRODUCTION IN SHALLOW WATER BODIES,
Deutsche Akademie der Wissenschaften zu Berlin (East Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W75-08769

THE RADIOACTIVE, METALLIC AND BACTERIAL POLLUTANTS IN THE ESTUARY OF

THE ESCAUT (SCHELT) RIVER AND ON THE COAST OF BELGIUM, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
For primary bibliographic entry see Field 5A.
W75-08774

MARINE TRADES AND THE COASTAL CRISIS,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 6B.
W75-08784

WAVE REFRACTION ANALYSIS: AID TO INTERPRETATION OF COASTAL HYDRAULICS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08800

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS MAKES HIGH QUALITY WATER NOW,
Universal Oil Products Co., San Diego, Calif.
S. S. Kremen.
Environmental Science and Technology, Vol 9, No 4, p 314-318, April 1975. 5 fig, 3 tab.

Descriptors: *Reverse osmosis, *Water supply, *Reclaimed water, Membrane processes, Separation techniques, Economics, Capital costs, Operating costs, Costs, Municipal wastes, Industrial wastes, Waste water treatment, Water purification, *Desalination, Water treatment, Brackish water, Energy.

The concept of reverse osmosis is reviewed, followed by a brief discussion of its effectiveness in purifying different types of water (brackish water, municipal and industrial waste waters). The economics (capital and operating costs) of reverse osmosis treatment, both as a means of water purification from a brackish source and as part of a municipal waste effluent treatment sequence, are discussed. Reverse osmosis installations in the United States and other parts of the world are listed, and the energy requirements for converting sea water to potable water by the distillation and reverse osmosis processes are compared. (Witt-IPC)
W75-08564

RESEARCH ON REVERSE OSMOSIS MEMBRANES FOR PURIFICATION OF WASH WATER AT STERILIZATION TEMPERATURE (165F), REPORT NO 2,
General Electric Co., Lynn, Mass. Direct Energy Conversion Programs.
M. E. Nolan, and A. B. LaConti.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 521, $4.25 in paper copy, $2.25 in microfiche. Report INT-OSW-RDPR-75-1003, June 1975. 53 p, 9 fig, 19 tab, 12 ref. Contract 14-30-2752.

Descriptors: Reclamation, *Waste water treatment, *Reverse osmosis, *Desalination, *Membranes, *Water reuse.
Identifiers: *Wash water, Sulfonated polyphenylene oxide, Sterilization, Tubular reverse osmosis, Polour polysulfone.

The goal was to develop viable reverse osmosis (RO) modules and systems of tubular design of approximately 80 gpd capacity to recover wash water

at sterilization temperatures. An 80 gpd RO system was fabricated for recovering wash water at sterilization temperatures. The performance characteristics of ancillary components including particulate filters, gauges, meters, RO pump, accumulator carbon polishing column were verified by integrating the components into a suitable subsystem containing the RO module and life testing with wash water. The twenty tube module was used to define the total system and identify/correct some of the life limiting problems, and was tested under simulated mission conditions with wash water. It appears a viable 80 gpd sulfonated PPO RO system for recycling wash water at sterilization temperatures and meeting the National Academy of Science (NAS) specifications if feasible. Some further work should be conducted to improve reliability and obtain a more weight/volume effective system.
W75-08575

LABORATORY PROGRAM TO STUDY FLASHING AND SCALING CHARACTERISTICS OF GEOTHERMAL BRINES,
Dow Chemical Co., Midland, Mich.
J. S. Wilson, and G. R. Warren.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-233 051, $4.75 in paper copy, $2.25 in microfiche. Report INT-OSW-RDPR-74-969, June 1973. 87 p, 30 fig, 11 tab, 1 ref. OSW Contract 14-30-2936.

Descriptors: Geothermal studies, *Brines, Hydrogen sulfide, Flocculation, Silica, Scaling, Corrosion, Oxidation, Desalination processes, Desalination plants, California, Solid wastes.
Identifiers: *Geothermal brines, Imperial Valley(Calif), *Flashing, Boric acid.

The purpose was to identify and study problems associated with the production of desalted water in a dual-purpose geothermal flash plant. The investigation was carried out by controlled flashing of a brine, prepared to simulate the geothermal brine expected to be found in the Imperial Valley of California. Anticipated problem areas were boric acid and hydrogen sulfide carry-over into the product water, solids in the waste stream, scaling in the flash equipment and corrosion. On unexpected problem, low pH of the product water, was encountered. Scaling did not occur but may be a problem in a continuous plant. Corrosion of 316 stainless steel, nickel, and monel did occur but no rates were determined.
W75-08590

METHOD OF DESALINATING SALT WATER,
Atomic Energy Commission, Washington, D.C. (Assignee).
M. R. Fox, and E. S. Grimmett.
U.S. Patent No 3,872,909, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 932, No 4, p 1382, March 25, 1975.

Descriptors: *Patents, *Desalination processes, *Water treatment, Steam, Temperature, Sea water, *Saline water.
Identifiers: Critical temperature, Critical pressure.

A method for desalinating salt water is described in which a fluidized bed of salt particles is established and maintained at a pressure above the critical pressure of water. Steam is passed upward through the fluidized bed heating it to above the critical temperature of water. Salt water is introduced into the bed and steam is taken off from the fluidized bed. The fluidized bed is formed of salt particles having a size range between about 0.3 and 0.6 mm and is operated at 3500 psia and about 705 deg F. (Sinha-OEIS)
W75-08631

METHOD OF DISTILLING SEA WATER ON SMALL SHIPS AND MARINE PLATFORMS HAVING INTERNAL COMBUSTION ENGINE,
A. J. Arnold.

U.S. Patent No. 3,864,215, 2 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 318, February 4, 1975.

Descriptors: *Patents, *Distillation, *Water treatment, *Desalination, Sea water, Heat exchangers, Condensation, Saline water, Ships, Offshore platforms, Separation techniques.
Identifiers: Demister, Internal combustion engine, Heat of condensation, Vaporization, Flash vaporization.

Vaporization and condensation are carried on in a closed chamber at pressures reduced to permit flash vaporization at temperatures available from the water jacket of an internal combustion main engine. Heating tubes are mounted adjacent the bottom of the closed chamber and connected to the water jacket. Condenser tubes are mounted in the top of the closed chamber and connected to cool circulating sea water. Spray nozzles are mounted above the heater tubes and connected with a supply of heated sea water. A demister is mounted above the spray nozzles for detraining sea water droplets carried upward by vapor rising from the heater tubes. A collector for condensate is secured below the condenser tubes and connected to an exterior condensate line. Pressure in the closed chamber is reduced by connecting it to a low pressure area of a venturi installed in a cool sea water circulating line to the condenser tubes. A first branch of this sea water circulating line goes to a first heat exchanger that is also connected in the exterior condensate line for cooling the condensate. A second branch carries sea water, warmed by heat of condensation absorbed in the condenser tubes, to be further preheated by hot condensate which in turn is cooled in a second heat exchanger also connected in the condensate line ahead of the first heat exchanger. The preheated sea water is utilized by feeding to the spray nozzles for spraying on the heater tubes for flash vaporization of part and recirculation of the rest back to the spray nozzles and overboard. (Sinha-OEIS)
W75-08737

SEA WATER DESALTING APPARATUS,
Pioneer Science Ltd., Kowloon (Hong Kong). (assignee)
W. Hsiao.
U.S. Patent No. 3,864,932, 5 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 562, February 11, 1975.

Descriptors: *Patents, *Crystallization, *Desalination apparatus, Salt water, Potable water, Condensation, Sea water.
Identifiers: Partial vacuum, Subatmospheric pressure.

The invention is an apparatus for separating potable water from salt water by forcing salt water under pressure through one or more spray nozzles to reduce the water to a fine mist or fog. The salt water is introduced into a treatment chamber having a subatmospheric pressure or partial vacuum which permits potable water to be separated from the salt water by crystallization in which the potable water is frozen into crystalline form or by condensing portions of the mist or fog to recover potable water. (Sinha-OEIS)
W75-08747

APPARATUS FOR EVAPORATING LIQUIDS,
Aktiebolaget Atomenergi, Stockholm (Sweden). (Assignee).
P. H. E. Margen.
U S Patent No 3,879,265, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 4, p 1735, April 22, 1975.

Descriptors: *Patents, *Desalination apparatus, *Evaporation, Sea water, Salt water, Separation techniques, Equipment, Steam, Water treatment.

An apparatus for evaporating liquids, particularly for evaporating salt water under low pressure in a desalination plant, comprises a liquid emitter, a guide surface along which the liquid flows, and a means for collecting the liquid. The guide surface consists of at least two guide vanes, each having only one curve, arranged one after the other. The generatrices have substantially the same direction. The adjacent guide vanes are oppositely curved. The liquid emitter is arranged to conduct the liquid towards the concave side of the first guide vane and the means for collecting liquid is arranged to conduct the water from the concave surface of the last guide vane. A film of liquid flowing along the guide vanes is subjected to oppositely directed centrifugal force fields on neighboring guide vanes and exposure on opposite surfaces to produce steam and separate it. (Sinha-OEIS)
W75-08762

DISTILLATION APPARATUS,
G. C. Sorensen.
U S Patent No 3,879,266, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 933, No 4, p 1736, April 22, 1975.

Descriptors: *Patents, *Distillation, *Desalination apparatus, *Water treatment, *Evaporation, *Heat exchangers, Equipment, Salt water, Sea water, Fresh water.

A distillation report is provided which includes a raw fluid submerged device for spraying raw fluid upward against the under surface of a splash shield to be greatly atomized providing an immense total raw fluid surface are for evaporation. A combination pump and compressor draws vapor from the splash shield protected atomized raw fluid urged and heated for evaporation by the mingling commonly wasted heat from a cooperating combustion engine. The resultant mixture of vapor is compressed and condensed in a heat exchanger submerged in the included raw fluid sump. The resultant condensate is accumulated for biological production while a concentrated raw fluid is drained for further process or waste and the dehydrated gas is expanded through a fueling system turbo blower than recycled for further condensate entrainment. (Sinha-OEIS)
W75-08763

3C. Use Of Water Of Impaired Quality

ANALYSIS AND DESIGN OF SETTLING BASINS FOR IRRIGATION RETURN FLOW,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-08484

3D. Conservation In Domestic and Municipal Use

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME I: COMPLETION REPORT,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 6A.
W75-08352

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVıRONMENTS, VOLUME II: THE WATER GAME--GAMING SIMULATION FOR URBAN WATER RESOURCES PLANNING,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 6A.
W75-08353

EFFECTS OF PRICE CHANGE UPON THE DOMESTIC USE OF WATER OVER TIME,
Clemson Univ., S.C. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W75-08355

WATER CONSERVATION BY THE USER,
General Dynamics Corp., Groton, Conn. Electric Boat Div.
H. E. Bostian, S. Cohen, and H. Wallman.
Paper presented at the International Public Works Congress and Equipment Show, Denver, Colorado, September 16-20, 1973. 13 p, 1 fig, 3 tab.

Descriptors: *Water conservation, *Domestic water, *Municipal water, *Impaired water use, *Water supply, *Water demand, Conservation, Water utilization, Water users, Surveys, Water reuse, Reclaimed water, Recirculated water, Urbanization, Economic impact.
Identifiers: *Water fixtures.

Conservation of water can extend the reserves of our treated and natural water supplies and will obviously lower per capita costs of water supply and wastewater treatment. Where the reduction of sewage flow is important, reduction of infiltration is probably the best approach. However, when water supply is the problem, water conservation is the only way to reduce demand. Two aspects of water conservation are considered: (1) reducing the domestic use of water, and (2) recycling water in the home. Domestic water is but a small percentage of total water use, but it accounts for a fairly large percentage of water obtained from public water supplies. Domestic water conservation can be directly reduced by plumbing fixtures that require less water, as well as a conceptualized and tested fixtures that can recycle a portion of household waste water for uses not requiring drinking water quality. A user survey showed high acceptance of proposed water conservation and recycling systems. Included were flow-limiting shower heads, shallow-trap toilets, and dural-flush devices. Because of numerous factors involved in using these devices, it is also necessary to examine sociological, economic and technical problems. Total municipal use patterns may offer greater potential for water conservation. (Poertner)
W75-08360

URBAN STORM RUNOFF, PUGET SOUND REGION, WASHINGTON,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5G.
W75-08492

TOTAL URBAN WATER POLLUTION LOADS: THE IMPACT OF STORM WATER,
Enviro Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5B.
W75-08677

ASPECTS OF HYDROLOGICAL EFFECTS OF URBANIZATION.
American Society of Civil Engineers, New York.
Task Committee on the Effects of Urbanization on Low Flow, Total Runoff, Infiltration, and Ground-Water Recharge.
For primary bibliographic entry see Field 4C.
W75-08697

ARTIFICIAL RECHARGE IN THE URBAN ENVIRONMENT--SOME QUESTIONS AND ANSWERS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4B.
W75-08822

WASTEWATER RECLAMATION AND RECHARGE, BAY PARK, N.Y.,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5D.
W75-08827

STREAM RECONNAISSANCE FOR NUTRIENTS AND OTHER WATER-QUALITY PARAMETERS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Carnegie, Pa.
For primary bibliographic entry see Field 5A.
W75-08835

THE IMPACT OF WATER QUALITY OBJECTIVES ON URBAN WATER SUPPLY PLANNING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-08845

EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08847

CONTRASTS IN COMMUNITY ACTION AND OPINION,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 5G.
W75-08848

3E. Conservation In Industry

ENERGY PRODUCTION AND WATER SUPPLY,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W75-08369

ENERGY-WATER RELATIONSHIPS: MANAGEMENT AND CONSERVATION IN THE CALIFORNIA-COLORADO RIVER - GREAT BASIN REGIONS,
Nevada Univ., Reno.
For primary bibliographic entry see Field 6B.
W75-08370

INDUSTRIAL WATER RESOURCES OF CANADA, THE HUDSON BAY, LABRADOR AND ARCTIC DRAINAGE BASINS, 1959-65,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W75-08395

FEEDING CATTLE AT THE PULP MILL,
Tampella A.B., Tampere (Finland).
For primary bibliographic entry see Field 5D.
W75-08539

ENVIRONMENTAL PROTECTION IN KRAFT PULP MILLS,
Munksjo A.B., Jonkoping (Sweden).
For primary bibliographic entry see Field 5D.
W75-08566

ECOLOGICAL APPROACH TO POWER GENERATION UNDER ENVIRONMENTAL CONSERVATION,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 6G.
W75-08604

GEOTHERMAL EXPLORATION,
Atlantic Richfield Co., New York. (assignee)
For primary bibliographic entry see Field 4B.
W75-08616

GEOTHERMAL HEAT EXHANGE METHOD AND APPARATUS,
For primary bibliographic entry see Field 4B.
W75-08618

METHOD OF RECOVERING GEOTHERMAL ENERGY,
Mobil Oil Corp., New York. (assignee)
For primary bibliographic entry see Field 4B.
W75-08736

SLIME CONTROL COMPOSITIONS AND THEIR USE,
Betz Labs., Inc., Trevose, Pa. (assignee)
For primary bibliographic entry see Field 5D.
W75-08739

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES--FLAT GLASS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-08781

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: RUBBER PROCESSING INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-08782

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR SELECTED SEGMENTS OF THE SEAFOOD PROCESSING INDUSTRY. (CATFISH, CRAB, SHRIMP AND TUNA),
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-08783

3F. Conservation In Agriculture

EFFECT OF BEAN POD MOTTLE VIRUS ON YIELD COMPONENTS AND MORPHOLOGY OF SOYBEANS IN RELATION TO SOIL WATER REGIMES: A PRELIMINARY STUDY,
Mississippi State Univ., State College.
For primary bibliographic entry see Field 5C.
W75-08359

A MODEL FOR ESTIMATING DESIRED LEVELS OF NITRATE-N CONCENTRATION IN COTTON PETIOLES,
California Univ., Davis. Dept. of Water Science and Engineering.
D. W. Grimes, W. L. Dickens, H. Yamada, and R. J. Miller.
Agron J. Vol 65, No 1, p 37-41, 1973, Illus.

Descriptors: *Cotton(Field), Soils, *Soil-water-plant relationships, Semiarid climates, *Nitrogen, *Density, Fertilizers, *Nutrient requirements, *Water requirements, *Plant populations.
Identifiers: Gossypium-Hirsutum, Petioles.

Field studies were conducted on 2 widely different soils over a 3-yr period in a semiarid irrigated region to establish functional relations between responses of cotton (Gossypium hirsutum L.) plants and the major production input factors: water, N and plant density. The nitrate-N concentrations of petioles from the most recently matured leaves were influenced by N-fertilization level, time of sampling in the season and water management. Plant population did not alter the

nitrate-N levels of petioles. High concentrations were associated with large amounts of N applied in side-dress soil applications. On a fine-textured soil with a high water-retention capacity N side-dressed after emergence was not taken up by the plant until the 1st irrigation was added. Concentrations of nitrate-N in petioles at critical times in the season were characterized by a 2nd-degree polynomial model having water and N quantities as independent variables (0.54 less than or equal to R2 less than or equal to 0.94). A 2nd model was subsequently developed that incorporates time as an independent variable in addition to water and N quantities. Using a yield equation and model 2, a procedure was developed that enables time-dependent 'desired' levels of plant nutrient concentrations to be established that are dependent on commodity price and production factor costs.--Copyright 1973, Biological Abstracts, Inc.
W75-08396

EFFECTS OF FRUIT LOAD, TEMPERATURE AND RELATIVE HUMIDITY ON BOLL RETENTION OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
C. F. Ehlig, and R. D. Mert.
Crop Sci. Vol 13, No 2, p 168-171. 1973, Illus.

Descriptors: *Cotton(Field), Field crops, *Environmental effects, *Plant growth, Temperature, Humidity.
Identifiers: Boll retention, Climatological effects, Fruit load, Gossypium-Hirsutum.

Climatological factors and the boll load from the 1st fruiting cycle were evaluated as primary causes for low boll retention by cotton (Gossypium hirsutum L.) during midseason. Boll retention was permitted from incipient flowering, or after June 26, July 15, July 30 or Aug. 14, by the daily removal of flowers. Boll retention was greater than 75% initially, but decreased to less than 50% after bolls equivalent to 500-1200 kg lint/ha (1-2 bales/acre) were retained and less than 20% after bolls equivalent to 700-1300 kg lint/ha (1.25-2.25 bales/acre) were retained. The fruit load was the primary cause for low boll retention and cessation of flowering during midseason. No direct relationship between low boll retention and high maximum or minimum temperatures or high relative humidity was observed.--Copyright 1973, Biological Abstracts, Inc.
W75-08397

PERSISTENCE OF SELECTED ANTITRANSPIRANTS,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2D.
W75-08439

AN ECONOMIC ANALYSIS OF CHANGES IN IRRIGATION PRACTICES IN JEFFERSON COUNTY, IDAHO,
Idaho Univ., Moscow. Department of Agricultural Economics.
J. E. Milliner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 343, $5.25 in paper copy, $2.25 in microfiche. M S Thesis, August 1974. 100 p, 5 fig, 24 tab, 22 ref, 4 append. OWRT B-033-IDA(2).

Descriptors: *Irrigation practices, *Idaho, Feasibility studies, *Water table, Economics, *Linear programming, *Sprinkler irrigation, Crop rotation, Model studies, *Cost analysis, Cost comparison.
Identifiers: Parametric analysis, Rotation policy, Center-pivot sprinkler systems.

Economic effects of solving a high water table problem in southeastern Idaho near Rigby were analyzed. The objectives were to analyze the farm situation and to determine the feasibility of solving

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the problem by decreasing water use at the farm level. Two methods were used: one involved a theoretical decrease of water availability without alterations to the present farm irrigation system while the second involved a water decrease by incorporating sprinkler systems to the area. Primary and secondary information was collected and representative budgets were used for 80, 160, and 320 acre farms. An optimum organization of farms was achieved through linear programming. A parametric routine was entered into the linear model, reducing the water in five percent intervals. This substantially affected income at both 25 and 50 percent reduction levels, primarily because the water reductions made tillable land unproductive. Budgets were developed for hand-moved, wheel-moved and a center-pivot sprinkler system; costs were then deducted from the linear programming solution and analyzed. The cost comparison showed that the sprinkler system was more profitable.
W75-08481

METHODOLOGY FOR OBTAINING LEAST COST IRRIGATION STEM SPECIFICATIONS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
J. R. Busch.
Available from the National Technical Information Service, Springfield. Va 22161 as PB-242 386 $7.50 in paper copy, $2.25 in microfiche. Ph D Thesis, December 1974. 214 p, 28 fig, 18 tab, 76 ref, 3 append. OWRT B-028-IDA(2). B-033-IDA(3).

Descriptors: *Irrigation systems, *Methodology, Model studies, *Linear programming, Dynamic programming, Water wells, Cost analysis, *Idaho, Pumping.
Identifiers: *Least cost irrigation, High lead pipelines, *Parametric programming, Handline sprinklers, Sideroll sprinklers.

A methodology for obtaining least cost irrigation systems specifications was developed and applied. Irrigation systems as defined, consisted of application system and distribution components and did not include reservoirs of any type. An analytical model employing a two-stage dynamic linear-programming technique was used to select and arrange system such that a least cost overall system would result. Based on cost function, more costly and less efficient distribution system component combinations were eliminated. Linear and parametric programming were applied to the model in North Rigby Irrigation District, Jefferson County, Idaho to determine least cost rehabilitation schemes for various specified conditions. Results showed that the analytical model is a valid tool.
W75-08482

EFFECTS OF DATE AND DEPTH OF PLANTING ON THE ESTABLISHMENT OF THREE RANGE GRASSES,
Colorado State Univ., Fort Collins. Dept. of Range Science.
W. J. McGinnies.
Agron J. Vol 65, No 1, p 120-123. 1973.

Descriptors: *Grasses, *Wheat grasses, Range grasses, *Forage grasses, Soil moisture, *Plant growth, *Soil-water-plant relationships, Plant physiology, Seasonal, Spring, Summer, Crop response.
Identifiers: Agropyron-Desertorum, Agropyron-Trichophorum, Depth of planting, Elymus-Junceus, Planting depth.

Crested wheatgrass (Agropyron desertorum (Fisch. ex Link) Schult.), pubescent wheatgrass (A. trichophorum (Link) Richt.) and Russian wildrye (Elymus junceus Fisch.) were planted at depths of 1.3, 2.5, 3.8, and 5.1 cm on average dates of planting of April 4, April 18, May 4, May 20, and June 9, 1967 through 1970 north of Fort Collins, Colorado. Crested wheatgrass and Russian

wildrye were also planted at the same depths on average dates of planting of April 20, May 3, May 18, and June 8, 1968 through 1970 on Central Plains Experimental Range (CPER) near Nunn, Colorado. Establishment was evaluated from seedling counts made in Sept. of the year of planting. At Fort Collins the greatest average number of seedlings was obtained from the April 18, May 4, and May 20 dates of seeding. Although year-to-year variations were great, the most reliable establishment was from the April 18 planting. At CPER, establishment from the June 8 planting was markedly poorer than for the 3 earlier dates of planting. Number of seedlings per meter of row was essentially the same for 1.3- and 2.5-cm planting depths within species and locations except that crested wheatgrass averaged 12% more seedlings from 1.3-than from 2.5-cm depths at Fort Collins. At 3.8 cm, numbers declined to about 50% of those in the shallower depths and declined still more at 5.1 cm. The decline was about 50% as much for pubescent wheatgrass as for crested wheatgrass and Russian wildrye. Soil moisture in the zone 2.5-5.1 cm deep appeared to be most critical for establishment. When moisture at this soil depth averaged less than 12% following seeding, stands contained only 53% as many seedlings as when the soil moisture averaged above 12%.--Copyright 1973, Biological Abstracts, Inc.
W75-08546

WATER INTAKE RATES ON A SILT LOAM SOIL WITH VARIOUS MANURE APPLICATIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-08574

SPRINKLER AND SOAKER IRRIGATION OF PEACH TREES TO REDUCE PLANT WATER STRESS AND INCREASE FRUIT SIZE,
Florida Univ., Gainesville. Dept. of Fruit Crops.
P. L. Ryan, J. F. Bartholic, and D. W. Buchanan.
Proceedings of the Florida State Horticultural Society, Vol 86, November 6-8, 1973, p 311-315. 3 fig, 1 tab, 4 ref. OWRR B-014-FLA(1). 14-31-0001-3868.

Descriptors: *Evapotranspiration, Evapotranspiration control, Energy budget, Water balance, Fruit crops, *Peaches, *Sprinkler irrigation, Soil moisture, Orchards.

'Early Amber' peach trees were irrigated using intermittent daily sprinkling, soaker hoses, and recommended overhead sprinklers. The first 2 systems were designed to maintain a constant soil moisture level near field capacity. The intermittent sprinkling, in addition, modified the trees' environment through evaporative cooling. On trees with about 300 fruit, sprinkling produced the largest fruit yielding 47% that were 2 inches or larger in diameter, while trees irrigated with soaker hoses yielded approximately 18% and the controls 10%. (Morgan-Florida)
W75-08596

RESPONSE OF THREE CORN HYBRIDS TO LOW LEVELS OF SOIL MOISTURE TENSION IN THE PLOW LAYER,
Agricultural Research and Educational Center, Quincy, Fla.
F. M. Rhoads, and R. L. Stanley, Jr.
Agron J, Vol 65, No 2, p 315-318, 1973, Illus.

Descriptors: *Corn(Field), *Soil moisture, Soil-water-plant relationships, *Irrigation effects, Crops, Field crops, Grains(Crops), Plant growth.
Identifiers: Hybrids(Corn).

The response of 3 corn (Zea mays L.) hybrids to irrigation treatments that were designed to maintain soil moisture tension at low levels (less than 1-bar) in plow layer rather than the entire root zone was

evaluated. Flowering date, plant height and grain yield were used as indexes of response. Irrigation was applied at 4 levels (0.3, 0.6, 2.0 and 5.0 bars) of soil moisture tension in 1970 and at 3 levels (0.2, 0.4, and 0.6 bars) in 1971. N was applied in 336 and 560 kg/ha, in 1971, to treatments irrigated at 0.2 bar of soil moisture tension. Each irrigation treatment was replicated 4 times and consisted of applying water at a selected value of soil moisture tension. A tensiometer was placed in each plot to be irrigated at soil moisture tensions below 1 bar in order to monitor soil moisture tension at a depth of 15 cm. Electrical resistance units were used in 1970 to monitor soil moisture tension in plots irrigated at tensions above 1 bar. Flowering occurred earlier and plant height increased as soil moisture tension at irrigation decreased. Grain yields were increased significantly (5% level) each year when plots were irrigated at 0.2 and 0.3 bar soil moisture tension instead of 0.6 bar. Irrigation at 0.6 bar did not increase grain yields in comparison with no irrigation in 1970. Each corn variety gave an inverse linear grain yield response to soil moisture tension values between 0.2 and 0.6 bar in 1971. There was a significant difference (5% level) between varieties in magnitude of grain yield response to irrigation in 1971. Highest grain yields were produced each year when soil moisture tension in the plow layer was maintained below 1/3 bar.--Copyright 1973, Biological Abstracts, Inc.
W75-08600

NITRATE UPTAKE EFFECTIVENESS OF FOUR PLANT SPECIES,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-08607

EMITTER VALVE FOR SOIL IRRIGATION,
Salco Products, Inc., Los Angeles, Calif. (assignee)
D. Werner.
US Patent No 3,874,591, 7 p, 12 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 197, April 1, 1975.

Descriptors: *Patents, *Irrigation systems, *Surface irrigation, *Soil moisture, *Water distribution(Applied), Equipment, Valves.

The emitter valve, which is useful for irrigation of soil, includes a valve body placed intermediate the ends of a supply conduit and provided with a valve head. The head has an inlet connected to the supply conduit and one or more outlets opening to the valve exterior for supply of controlled amounts of water to the soil. The valve outlet are unobstructed by the deformable cylinder regardless of operational pressures exerted thereon by a set screw except when great set screw pressure is exerted to purposely shut off flow of water. The amount of water released by the valve is determined by the pressure of water in the supply conduit which overcomes the applied pressure of the set screw and cylinder in order to deform the cylinder and to allow water to pass around the cylinder, its grooves, and the shell-shaped opening to the soil. (Sinha-OEIS)
W75-08614

MOISTURE RESPONSIVE APPARATUS FOR CONTROLLING MOISTURE CONTENT OF SOIL,
W. H. Gibson.
US Patent No 3,874, 590, 11 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 197, April 1, 1975.

Descriptors: *Patents, *Irrigation system, *Surface irrigation, *Water distribution(Applied), *Soil moisture, Valves.
Identifiers: Pilot values, Sensors.

A moisture responsive apparatus is disclosed for automatically controlling the operation of a soil ir-

rigation system. The apparatus includes a moisture sensor having a perforated tubular sensing element adapted to be placed in contact with or in proximity to the soil and made of a material, such as nylon, that absorbs moisture and expands in accordance with the amount of moisture absorbed. The expansion and contraction of the sensing element relative to a menber whose dimensions are unaffected by moisture are used to operate a pilot valve which in turn supplies a small control flow that actuates an irrigation system valve. The sensing element and related member may have the same coefficient of thermal expansion to compensate for dimensional changes due to temperature variations, and may be adjustably coupled to permit setting the moisture content operating limits of the pilot valve. The sensing element may comprise a plurality of concentric, serially connected sensing tubes to increase the sensitivity of the sensing element for a given overall length. The sensing element may also include reinforcing ribs projecting from the exterior surface and may also be isolated from direct contact with the soil by means of a moisture-permeable screen placed about the element but not contacting it. (Sinha-OEIS)
W75-08615

IRRIGATION CONTROL,
R. E. Shettel.
US Patent No 3,874,176, 5 p, 17 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 62, April 1, 1975.

Descriptors: *Patents, *Irrigation systems, *Water distribution(Applied), Equipment, Open channel flow, Conduits.
Identifiers: *Open channel irrigation.

A balancing assembly for controlling the diversion of water in a channel comprises a dam positioned in a channel, the top surface of which includes a depression adapted to receive an opening spill segment, and a pivot permitting pivotal movement of the dam relative to the channel. It has a seal depending from the perimeter of the dam for bearing agains the channel when the dam is in the closed position. Controls for pivoting the dam are attached to the dam and permit relative movement between the controls and the dam. On extremity of the controls extend downward from the attachment to bear against the channel for support and another extremity of the controls extends upward from the attachment to permit the actuation of the controls to selectively space the dam apart from the channel. (Sinha-OEIS)
W75-08617

WEEPER IRRIGATION SYSTEM AND METHOD,
W. C. Reeder, and N. D. Batterson.
US Patent No 3,873,031, 7 p, 14 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 932, No 4, p 1423, March 25, 1975.

Descriptors: *Patents, *Irrigation systems, *Surface irrigation, Equipment, Mist irrigation, Water distribution(Applied), Distribution system.
Identifiers: *Weeper irrigation system.

A weeper type irrigation system and method features unusual flexibility of use and mode of assembly. The weeper proper is installable in a self-sealing manner in the side of a plastic water distributing manifold or tube. It is operable to provide either a misty spray discharge into the air of weeper flow at more than one selected rate. The weeper flow may be directed laterally into the air or conducted to a more remote discharge point or along the exterior of the weeper. The weepers are readily installable remote from or in close proximity to one another and each is individually operable at will to dispense water in a selected manner and at a selected rate. A protective cap is installable with a snap fit over the outer end and selectively adjustable thereon to provide fast or slow weeper

flow as well as to convert the discharge between a confined flow at either a slow or fast rate and into a widely dispersed mistly spray or a confined flow. (Sinha-OEIS)
W75-08621

ONE-PIECE DRIP IRRIGATION DEVICE,
J. S. Barragan.
US Patent No 3,873,030, 2 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 932, No 4, p 1423, March 25, 1975.

Descriptors: *Patents, *Irrigation system, *Surface irrigation, Equipment, Water distribution(Applied), Distribution system.
Identifiers: *Drip irrigation.

A one-piece drip irrigation device is attached to a perforated wall of an irrigation liquid supply pipe. The device comprises a casing having side and bottom walls and a flange extending outwardly from the edges of an open wall of the casing. The flange when attached to the pipe wall constitutes an enclosed housing having a multiplicity of alternate walls that form a passage provided with a multiplicity of obstacles to free flow of liquid. Included in one of its ends is a perforation for liquid exit at lowered pressure. (Sinha-OEIS)
W75-08622

DRIP-TYPE IRRIGATION EMITTER,
BPG Co., Inc., Mission, Tex. (assignee)
R. R. Ruben.
US Patent No 3,876,155, 8 p, 19 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 714, April 8, 1975.

Descriptors: *Patents, *Irrigation systems, *Water distribution(Applied), Equipment, Mist irrigation, Surface irrigation, Distribution systems, Automation.
Identifiers: *Drip irrigation, Emitter units.

A basic emitter unit is designed for automatic self-flushing and drip operation, but it can be readily modified by adding parts to convert it to a combination drip irrigation emitter and mister for spraying finely divided particles of heated water into the air to warm the air to prevent frost damage to plants, trees, ets. By the substitution of differently designed orifice discs, the basic emitter unit can be made self-flushing and to provide misting only, or to be self-flushing and function as an unlimited-pressure mister. By alternative minor disc modification, the basic emitter unit can be connected at the end of an irrigation line to effect flushing of the line only. The basic emitter unit is further characterized by its capability of (1) automatically compensating for variations in line pressure and changes in elevation of terrain; (2) maintaining a uniform flow rate regardless of variations in line pressure; (3) eliminating the necessity of water filtration; (4) when connected with other emitters in an irrigation line taking advantage of line friction and enabling flushing and seating of the emitters progressively under very low line pressure; and (5) eliminating the need for a dual pump system. (Sinha-OEIS)
W75-08628

SIMULATION MODEL FOR EVAPOTRANS-PIRATION OF WHEAT: EMPIRICAL APPROACH,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2D.
W75-08712

2020 HINDSIGHT: ANOTHER FIFTY YEARS OF IRRIGATION,
Committee on Interior and Insular Affairs (U.S. Subcommittee on Water and Power Resources.
D. A. Dreyfus.

Journal of the Irrigation and Drainage Division, ASCE, Vol 101, No IR2, Proceedings paper No 11363, p 87-94, June 1975. 4 ref.

Descriptors: *Irrigation, *Planning, *Water resources, *Water supply, Regional development, Reclamation, Agriculture, Management, Decision making, Water policy, Colorado River.
Identifiers: *Government agencies, Western U.S.

Water resources management has been a concern of governments from the time of the earliest recorded civilizations. In the United States, policies that have evolved over several decades to guide the Federal role in water resources planning and development are no longer relevant to national problems and goals. Water resources planning presently is in disarray because mechanical analysis has been subsitituted for continued policy guidance. The nation appears to be approaching a major reevaluation of governmental water resources policy. New objectives and a new Federal role will be defined. Recent social and economic conditions indicate that there will be renewed national interest in the management of western water resources and that irrigated agriculture will continue to be a significant function in Federal water policy. (Bell-Cornell)
W75-08721

APPARATUS FOR SUBSOIL IRRIGATION,
T. J. Frazier.
U.S. Patent No. 3,865,057, 9 p, 13 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 605, February 11, 1975.

Descriptors: *Patents, *Irrigation systems, *Subsurface irrigation, *Agricultural engineering, Wells, Conduits, Distribution systems, Water distribution(Applied), Water delivery.

The irrigation system includes a translatable vehicle having a number of horizontally spaced soil splitting shanks. The translatable vehicle is adapted to be progressively maneuvered over an area to be irrigated in alternate, adjacent parallel paths of movement, with water used for irrigation being pumped through reelable conduit from a stationary water supply source to pressure pumps located on the translatable vehicle. The water is delivered from the pressure pump through conduit operatively associated with each of the soil splitting shanks and is ejected into the subsoil of the area through openings located adjacent the lower portions of the soil splitting shanks. (Sinha-OEIS)
W75-08748

DYNAMICS OF HIGHER PLANT WATER METABOLISM AND ITS INFORMATION SIGNIFICANCE, (IN RUSSIAN),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2I.
W75-08789

DYNAMICS OF FREE AMINO ACID CONTENT IN LEAVES OF WINTER WHEAT UNDER VARIABLE CONDITIONS OF SOIL MOISTURE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
S. I. Slukhai, and O. P. Opanasenko.
Fiziol Biokhim Kul't Rast, 6(1): 47-53, 1974. English summary.

Descriptors: Plant physiology, *Wheat, Crops, Cereal crops, Agronomic crops, *Leaves, *Soil moisture, Water requirements, *Amino acids, Nitrogen compounds.
Identifiers: Asparagine, Proline, Winter wheat, *USSR.

A 2 yr study of free amino acid content in the winter wheat leaves in ontogenesis under green-

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house conditions showed that with a deficient and variable soil moisture their content was higher than with normal water-supply. It indicated a disturbance in metabolism of N compounds, an increase in the content of NH3 which enters the reaction of direct amination with organic acids and a delay in the N compound synthesis. With deficient water-supply the amount of asparagine and proline in leaves increased considerably. They might play a protective role in water deficits in plants.--Copyright 1975, Biological Abstracts, Inc. W75-08828

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

REGIONAL PROBLEM ANALYSIS IN THE PACIFIC NORTHWEST: PART A-INSTREAM FLOW NEEDS; PART B-BASALT AQUIFERS; PART C-WILD AND SCENIC RIVERS.
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 6B.
W75-08356

CLASSIFICATION AND WORLD DISTRIBUTION OF VEGETATION RELATIVE TO V/STOL AIRCRAFT OPERATIONS,
Army Engineer Topographic Labs., Fort Belvoir, Va.
For primary bibliographic entry see Field 7B.
W75-08366

ENERGY PRODUCTION AND WATER SUPPLY,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W75-08369

ENERGY-WATER RELATIONSHIPS: MANAGEMENT AND CONSERVATION IN THE CALIFORNIA-COLORADO RIVER - GREAT BASIN REGIONS,
Nevada Univ., Reno.
For primary bibliographic entry see Field 6B.
W75-08370

APPLICATIONS OF HYDROLOGY TO WATER RESOURCES MANAGEMENT (PLANNING AND DESIGN LEVEL),
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 6B.
W75-08400

REGIONAL WATER EXCHANGE FOR DROUGHT ALLEVIATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Takeuchi.
Hydrology Papers, No. 70, November 1974. 26 p, 6 fig, 3 tab, 16 ref. NSF Grants GK-11564, GK-31521X.

Descriptors: *Droughts, *Inter-basin transfers, *Mathematical studies, Water delivery, Ranges, Insurance, Diversion, Water transfer, Water supply, River basins, Water rights, Imported water, Social aspects, Hydrologic budget, Water shortage, Cost analysis, Feasibility, Hydrologic aspects, Economics, Geographical regions, Evaluation, Water resources development, Methodology, Analytical techniques, *Regional analysis.
Identifiers: *Drought alleviation, Cost-effectiveness.

Hydrologic, geographic, engineering, socioeconomic, and other feasibility conditions were investigated for the concept of regional water exchanges. As a drought alleviation alternative, it was determined that regional water exchanges, with bi-directional pipe-line networks, have some advantages over the other drought alleviation measures, external to users. The exchange systems have the advantage of being free from inter-regional controversies commonly involved with the uni-directional water transfer. The partial substitution for the required storage capacity is an important advantage of exchange systems. To measure the magnitude of this effect, the maximum reduction ratio of the sum of ranges was introduced and its implication and practical use were demonstrated by using the river basin systems of the west-central part of the United States as a case study. (Dawes-ISWS)
W75-08403

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II.
Colorado State University Hydrology Papers No. 69, September 1974. 31 p, 12 fig, 13 tab, 48 ref, 5 append. NSF Grant GK-11564.

Descriptors: *Optimization, *Stochastic processes, *Dynamic programming, *Analytical techniques, Simulation analysis, Operations research, Statistical methods, Optimum development plans, Mathematical studies, Reservoir operation, Water resources.
Identifiers: *Sequential optimization.

Reduction of computation effort in water resource optimization problems can be made through a modification of the optimization technique instead of limiting development of the system models. Considerations were presented which lead to the development of a heuristic application of deterministic optimization techniques. Stochastic optimization techniques that are used in water resource systems engineering were presented. A heuristic alternate stochastic optimization technique was then described and suggested as an improvement. For a single reservoir system, the techniques were applied and compared. Computation costs were reduced and system performance was improved with the use of the alternate. (Jess-ISWS)
W75-08404

THE FORMATION OF BRINE DRAINAGE FEATURES IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W75-08408

SEEPAGE CHARACTERISTICS OF FOUNDATIONS WITH A DOWNSTREAM CRACK,
Madras Univ., Guindy (India). Coll. of Engineering.
For primary bibliographic entry see Field 8D.
W75-08432

PROPERTIES OF THE THREE-PARAMETER LOG NORMAL PROBABILITY DISTRIBUTION,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-08438

WELSH FLOODPLAIN STUDIES: THE NATURE OF FLOODPLAIN GEOMETRY,
University Coll. of Wales, Aberystwyth.
For primary bibliographic entry see Field 2E.
W75-08448

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
For primary bibliographic entry see Field 5B.
W75-08460

MECHANICAL HARVESTING OF AQUATIC VEGETATION: DEVELOPMENT OF A HIGH SPEED PICKUP UNIT,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
H. F. Link.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 338, $4.75 in paper copy, $2.25 in microfiche. M.S. Thesis, 1974. 82 p, 37 fig, 10 ref, 4 append. OWRR B-018-WIS(5). 14-01-0001-1957.

Descriptors: Aquatic plants, *Rooted aquatic plants, *Harvesting, *Productivity, *Costs, *Wisconsin, *Aquatic weed control, Mechanical equipment.
Identifiers: Dane County lakes(Wis).

The unit described gathers and picks up cut vegetation floating on the water surface. The gathering system consists of two horizontal arms approximately one foot above the water arranged in a 'V' configuration with the open end forward and the vertex just ahead of the barge onto which they are mounted. Steel tines attached at approximately 5 inch intervals to chains extend vertically into the water, travel rearwards along the bottom of the arm to the vertex of the 'V' and then return forward along the top. If the forward velocity of the barge and the rearward component of tooth velocity are matched, the floating vegetation contacted by the teeth is concentrated sideways into a windrow, passes through a gap at the vertex of the 'V' and is elevated onto the barge by a slatted conveyor, the bottom end of which extends just below the water surface. Tests were run using various forward velocities and angles between the arms. Power requirements were measured and collection performance was evaluated. While the collection performance was deemed satisfactory, power requirements indicated that friction losses in the arms were high. Consequently, a redesign of the arm mechanism was indicated. In addition to the collecting arms the barge which carried them was designed and built using two aluminum military bridge pontoons. Dewatering rolls used in conjunction with the pickup conveyor were ineffective, while a pinch-off roll with radial blades appeared promising for reducing the vegetation to short lengths which were easily handled. (Koegel-Wisconsin)
W75-08471

DEVELOPMENT OF A MANAGEMENT FRAMEWORK OF THE GREAT SALT LAKE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W75-08473

URBAN STORM RUNOFF, PUGET SOUND REGION, WASHINGTON,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5G.
W75-08492

ESTIMATING STREAMFLOW CHARACTERISTICS FOR STREAMS IN UTAH USING SELECTED CHANNEL-GEOMETRY PARAMETERS,
Geological Survey, Salt Lake City, Utah.
F. K. Fields.
Available from NTIS, Springfield, Va 22161 as PB-241 541, $3.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 34-74, February 1975. 19 p, 2 fig, 10 tab, 7 ref.

Descriptors: *Flood recurrence interval, *Channel morphology, *Utah, *Streamflow, Alluvial channels, Sand bars, Flow characteristics.
Identifiers: *Channel geometry.

Channel-geometry parameters were studied in relation to mean annual streamflow and the 25- and 50-year recurrence-interval flood discharges of Utah streams. Channel width and depth between depositional bars can be used to estimate mean annual streamflow for perennial streams with a standard error of estimate of 34 percent. The standard error of estimate of mean annual streamflow for ephemeral streams is 73 percent. The 25- and 50-year floods on perennial and ephemeral streams can be estimated from the channel width between depositional bars with standard errors of estimate ranging from 28 to 43 percent. (Knapp-USGS)
W75-08494

POTENTIAL FLOOD HAZARD--NORTH AVENUE AREA, DENVER FEDERAL CENTER, LAKEWOOD, COLORADO,
Geological Survey, Denver, Colo.
R. U. Grozier, J. F. McCain, and G. L. Ducret, Jr.
Open-file report 75-45, 1975. 12 p, 1 fig, 1 plate, 1 tab, 5 ref.

Descriptors: *Floods, *Colorado, *Urbanization, *Urban hydrology, Urban runoff, Storm runoff, Hazards.
Identifiers: *Denver(Colo), *Flood hazards.

A potential flood hazard has been created on the Denver Federal Center by development of property adjacent to the northwest corner of the Center. Prior to development of the property, the 100-year 1-hour rainfall of 2.10 inches produced a peak discharge of 140 cubic feet per second at the west side of Union Street. This discharge entered Welch Ditch and the combined discharge of 205 cfs flowed south into McIntyre Gulch without overflowing the east bank of the ditch. Under developed basin conditions, the same rainfall would produce a peak discharge of 212 cfs. The total storm runoff would enter the Center through a 54-inch corrugated metal pipe recently constructed under Union Street and Welch Ditch. The 100-year flood discharge for developed basin conditions would cause damages to Buildings 67, 56, and 48. (Knapp-USGS)
W75-08496

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS-OKLAHOMA, 1972: 1974 WATER YEAR,
Geological Survey, Little Rock, Ark.
T. E. Lamb.
Open-file report, 1974. 26 p, 1 fig, 3 tab, 4 ref.

Descriptors: *Water yield, *Streamflow, *Arkansas, *Oklahoma, *Interstate compacts, Withdrawal, Data collections, Hydrologic data.
Identifiers: *Arkansas River Basin Compact.

The computed annual yield of subbasins in the Arkansas River basin as defined in the Arkansas River Basin Compact, Arkansas-Oklahoma, 1972, are presented. The annual yield and deficiency were computed for each subbasin. Actual runoff was compiled for the subbasins. Annual depletion caused by major reservoirs was computed for the four major reservoirs in the basin. (Knapp-USGS)
W75-08497

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1972-73,
Geological Survey, Tallahassee, Fla.
P. E. Meadows, and D. M. Hughes.
Open-file report 74021, 1974. 47 p, 28 fig, 8 tab, 6 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Surface waters, *Groundwater, *Florida, Water wells, Streamflow, Aquifers, Precipitation(Atmospheric).
Identifiers: *Volusia County(Fla).

Hydrologic conditions in Volusia County, Florida are summarized. The data are presented in tabular and graphic form. Data on wells, springs, and lakes are for May 1972 to May 1973; data on streams are for the 1972 water year, October 1, 1971 to September 30, 1972. Groundwater is the principal source of potable water in Volusia County. The major source of groundwater is the Floridan aquifer, an artesian system comprised of a thick sequence of limestone and dolomite; all observation wells for which data are included in this report tap the Floridan aquifer. A shallow aquifer consisting of sand and shell beds is a source of domestic water supply along parts of the east coast where the Floridan aquifer contains saline water. Average groundwater levels in the artesian aquifer have not declined appreciably in recent years over most of the county. Surface drainage in Volusia County is poorly developed, resulting in large swampy areas in much of the county. In the De Land Ridge area, both north and south of De Land, karst topography is well developed and drainage is internal by downward seepage to the Floridan aquifer. Streamflow leaving the county averages about 590 million gallons per day. (Knapp-USGS)
W75-08498

AN EVALUATION OF THE ERTS DATA COLLECTION SYSTEM AS A POTENTIAL OPERATIONAL TOOL,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-08503

FLOOD ON BUFFALO CREEK FROM SAUNDERS TO MAN, WEST VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08508

WATER RESOURCES OF THE CROW RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08511

RECONNAISSANCE OF THE UPPER AU SABLE RIVER, A COLD-WATER RIVER IN THE NORTH-CENTRAL PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08512

WATER RESOURCES OF THE BLUE EARTH RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08513

WATER RESOURCES OF THE CLINTON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08514

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1974,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W75-08516

MAGNITUDE AND FREQUENCY OF FLOODS IN WASHINGTON,
Geological Survey, Tacoma, Wash.
J. E. Cummans, M. R. Collings, and E. G. Nassar.
Open-file report 74-336, 1975. 46 p, 3 plate, 4 tab, 19 ref.

Descriptors: *Floods, *Washington, Flood frequency, Peak discharge, Regression analysis, Rainfall-runoff relationships.

Relations are provided to estimate the magnitude and frequency of floods on Washington streams. Annual-peak-flow data from stream gaging stations on unregulated streams having 10 years or more of record were used to determine a log-Pearson Type III frequency curve for each station. Flood magnitudes having recurrence intervals of 2, 5, 10, 25, 50, and 100 years were then related to physical and climatic indices of the drainage basins by multiple-regression analysis. These regression relations are useful for estimating flood magnitudes of the specified recurrence intervals at ungaged or short-record sites. Peak flows are related most significantly in western Washington to drainage-area size and mean annual precipitation. In eastern Washington they are related most significantly to drainage-area size, mean annual precipitation, and percentage of forest cover. (Knapp-USGS)
W75-08520

DESIGN AND IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL, 1971-74,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08523

COMPUTER PROCESSING HYDROLOGIC DATA IN BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08524

THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08526

MANAGEMENT STUDY OF SOME ASPECTS OF SISTEMA DE INFORMACOES HIDROLOGICAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08527

EFFECTS OF DATE AND DEPTH OF PLANTING ON THE ESTABLISHMENT OF THREE RANGE GRASSES,
Colorado State Univ., Fort Collins. Dept. of Range Science.
For primary bibliographic entry see Field 3F.
W75-08546

A CASE STUDY OF THE APPLICATION OF COST-BENEFIT ANALYSIS TO WATER SYSTEM CONSOLIDATION BY LOCAL GOVERNMENT,
Delaware Univ., Newark. Div. of Urban Affairs; and Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W75-08573

EFFECT OF ATMOSPHERIC STABILITY AND WIND DIRECTION ON WATER TEMPERATURE PREDICTIONS FOR A THERMALLY-LOADED STREAM,
Pennsylvania State Univ., University Park. School of Forest Resources.

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For primary bibliographic entry see Field 5B.
W75-08576

PROCESSING AND STORAGE OF WATER-HYACINTH SILAGE,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
L. O. Bagnall, J. A. Baldwin, and J. F. Hentges.
Hyacinth Control Journal, Vol 12, p 73-79, May 1974. 7 fig, 6 tab, 12 ref. OWRR A-017-FLA(6). 14-31-0001-3809.

Descriptors: Drying, Chemical analysis, Nutrients, Digestion, Aquatic weeds, *Water hyacinth, *Rooted aquatic plants, Animal physiology, Toxins, Feeds, *Aquatic weed control, Water pollution control, Storage.

Waterhyacinth (Eichhornia crassipes (Mart) Solms) was satisfactorily ensiled by chopping, pressing in a screw press to less than 90% moisture content, mixing with a free carbohydrate additive, and packing in small silos. Chopped waterhyacinth without pressing putrefies and shrinks excessively. Additional carbohydrate is necessary in most cases to cause fermentation to acceptable silage. Dried citrus pulp or cracked corn at 4% of the wet weight (20 to 25% of the dry weight) were found to be satisfactory carbohydrate sources, 2% being slightly less satisfactory. Quality of silage was unaffected by the addition of 0.5 or 1.0% standard cane molasses. (Morgan-Florida)
W75-08595

A NEW DORATOMYCES FROM WATER-HYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology,
K. E. Conway, and J. W. Kimbrough.
Mycotaxon, Vol 2, No 1, p 127-131, April-June 1975. 4 fig, 1 tab, 10 ref. OWRT A-027-FLA(5). 14-31-0001-4009.

Descriptors: *Water hyacinth, *Plant pathology, Aquatic fungi, *Aquatic plants, *Biocontrol, *Aquatic weed control, *Pathogenic fungi, Water pollution control.
Identifiers: *Plant pathogens, Saprophytes.

A project to survey fungi associated with waterhyacinth, Eichhornia crassipes, was begun in November 1973. The purpose was to find organisms that could be utilized as biocontrols of the prolific waterhyacinth. In February 1974, in a collection of decaying waterhyacinth laminae many light-buff colored synnemata were noted. This is probably the first report of a synnematal fungus occurring on waterhyacinth. Pathogenicity studies on waterhyacinth indicated that the organism was saprophytic. The conidiogenous cells appeared to be phialides but closer examination revealed annellations on which conidia are held in a dry loose head. The organism was assigned to the genus Doratomyces Corda sensu Morton and Smith (1963).
W75-08606

OCCURRENCE OF CEROCOSPORA PIAROPI ON WATER HYACINTH IN FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
T. E. Freeman, and R. Charudattan.
Plant Disease Reporter, Vol 58, No 3, p 277, March 1974. 1 fig. OWRR A-027-FLA(1). 14-31-0001-4009.

Descriptors: *Waterhyacinth, *Aquatic plants, *Biocontrol, Plant pathology, Aquatic weed control, *Florida, Water pollution control.
Identifiers: Plant pathogens, Cercospora piaropi, Leaf spot disease.

In the fall of 1972, water hyacinths (Eichhornia crassipes) in the vicinity of Gainesville, Florida were uniformly affected by a leaf spot disease.

Although extensive surveys have been made in search of diseases with biocontrol potential on this noxious plant, this spot disease differed from the others that had been thus far noted during these surveys. Leaf spots caused by Cerocospora piaropi were oval and ranged from approximately 1.5 to 4.0 mm in size. Smaller ones were uniformly purplish-black but developed a tan center as they enlarged. Spots were more concentrated on the distal portion of the leaf blade. In this area there was often confluence of lesions resulting in a general necrosis of the distal part of the leaf. Large lesions were often faintly zonate in the tan center. (Morgan-Florida)
W75-08610

LAND USE AND NUCLEAR POWER PLANTS - CASE STUDIES OF SITING PROBLEMS,
Directorate of Regulatory Standards (AEC), Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-08654

NEWPORT--MAIN DRAINAGE SCHEME TAKES SHAPE,
For primary bibliographic entry see Field 5D.
W75-08675

A TWO LAYER FLOW THROUGH A CONTRACTION,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W75-08701

SEEPAGE THROUGH OPENING IN CUTOFF WALL UNDER WEIR,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W75-08711

CHANNELIZATION: A SEARCH FOR A BETTER WAY,
North Carolina Univ., Charlotte. Dept. of Geography and Earth Sciences.
For primary bibliographic entry see Field 8B.
W75-08714

ENVIRONMENTAL GEOLOGY--AN AID TO GROWTH AND DEVELOPMENT IN LAUDERDALE, COLBERT AND FRANKLIN COUNTIES, ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-08718

2020 HINDSIGHT: ANOTHER FIFTY YEARS OF IRRIGATION,
Committee on Interior and Insular Affairs (U.S. Subcommittee on Water and Power Resources.
For primary bibliographic entry see Field 3F.
W75-08721

ENGINEERING ECONOMICS OF RURAL SYSTEMS: A NEW U S APPROACH,
National Water Well Association, Columbus, Ohio; and Rice Univ., Houston, Tex.
M. D. Campbell, and J. H. Lehr.
Journal American Water Works Association, Vol 67, No 5, p 225-231, May 1975. 20 ref.

Descriptors: *Water supply, *Rural areas, *Engineering, *Economics, Standards, Water quality, Operation and maintenance, Costs, Water policy, Wells, Projects, Alternative planning, Design, Safety factors.
Identifiers: Safe water.

Rural areas in the United States have always had difficulty in receiving services from public or private utilities. This discusses engineering principles and problems with regard to providing adequate, safe water supply services to rural areas. The public-private approach being used by the National Demonstration Water Project (NDWP) and the Com. on Rural Water is considered; the NDWP approach is discussed in detail. Local conditions and system design are explored and defined in both quantitative and qualitative terms. Weaknesses in the U.S. National delivery system are identified. Future funding agencies need to be less restrictive about the types of water systems they will finance. According to NDWP, the centrality of a water system may lie in (1) its water source and treatment configurations, (2) its type of management, or (3) both. NDWP assesses the degree of impact of the local conditions on the ultimate design of the system and then translates the impact into the system's design. System alternative types are evaluated in terms of system costs over project life. The effects of local field parameters are translated into estimated dollars in terms of their effect on construction, operation, and maintenance costs. Considered are central well systems vs. cluster well systems. (Bell-Cornell)
W75-08723

SAMPLE UNCERTAINTY IN FLOOD LEVEE DESIGN: BAYESIAN VERSUS NON-BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Hydrology and Water Resources Interdisciplinary Program.
For primary bibliographic entry see Field 8A.
W75-08724

APPLICATION OF A HYDROLOGIC MODEL FOR LAND USE PLANNING IN FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
P. B. Bedient, W. C. Huber, and J. P. Heaney.
Water Resources Bulletin, Vol 11, No 3, p 469-482, June 1975. 6 fig, 1 tab, 4 equ, 15 ref.

Descriptors: *River basins, *Land use, *Planning, Hydrology, *Ecology, *Simulation analysis, *Management, Mathematical models, Equations, Methodology, Reservoirs, Flood control, Environmental engineering, Vegetation, Water balance, Linear programming, Agriculture, Irrigation, Flood plains, Systems analysis, *Florida, Forecasting.
Identifiers: *Upper St. Johns River Basin(Fla).

An environmental simulation model of the Upper St. Johns River Basin in Florida has been developed in order to predict hydrologic responses under proposed management plans. Land use projections for each of 19 hydrologic planning units are provided by a linear programming analysis of agricultural activities. Inputs to the model include rainfall, runoff, evapotranspiration (ET), aquifer properties, topography, soil types, and vegetative patterns. A water balance is developed in the uplands based on infiltration, ET, surface runoff, and groundwater. Valley continuity is based on stage-volume relationship for inflows and outflows and a variable roughness coefficient dependent on vegetative patterns. Land use changes form the basis for predicting hydroperiod variation under alternative management schemes. Plans are ranked according to two criteria: deviation from a natural hydroperiod, and flood or drought control provided. Results indicate that (1) a single reservoir without irrigation and (2) floodplain preservation plans are superior to (3) multiple reservoir with irrigation and (4) uncontrolled floodplain plans with regard to both criteria. The next generation of simulation models in water resources planning should unite concepts from systems hydrology, systems ecology, and land use planning in order to achieve a more balanced view of the interacting dynamic processes. (Bell-Cornell)

W75-08727

OPTIMAL CAPACITIES OF WATER SUPPLY RESERVOIRS IN SERIES AND PARALLEL,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Regional Science.
M. Wathne, C. S. ReVelle, and J. C. Liebman.
Water Resources Bulletin, Vol 11, No 3, p 536-545, June 1975. 1 fig, 9 equ, 7 ref.

Descriptors: *Water supply, *Reservoirs, *Dynamic programming, Size, *River systems, *Water demand, Algorithms, Streams, Sites, Monthly, Construction costs, Alternative planning, Design, Optimization, Volume, Decision making, Inflow, Withdrawal, Hydrology, Operation research, Equations, Mathematical models.
Identifiers: *Optimal capacity, Sequent peak method, *Cost minimization.

Water supply reservoir planning has traditionally been based on the Rippl or sequent peak analysis which applies to the design of a single reservoir. This paper incorporates the sequent peak method as the central feature is establishing a procedure for determining the sizes of several potential reservoirs located in a system of one or more rivers. Separate algorithms are developed for sites on parallel streams and for sites on the same stream. In both cases, the approach is to find the combination of reservoirs which can satisfy a given constant monthly demand at a minimum total construction cost. It is shown that both problems can be solved as a dynamic programming problem. A more complex system, then is a combination of reservoirs in parallel and in series. An extension is given if the monthly demand is not constant but each reservoir satisfies a constant fraction of the monthly demand. (Bell-Cornell)
W75-08728

THE CIVIL ENGINEER AND FIELD DRAINAGE,
Ministry of Agriculture, Fisheries and Food. Lincoln (England).
R. H. Miers.
Journal of the Institution of Water Engineers, Vol 28, No 4, p 211-223, June 1974. 9 fig, 11 tab, 3 ref.

Descriptors: *Drainage systems, *Flooding, *Design, *Optimum development plans, *Civil engineering, *Standards, Agriculture, Water levels, Depth, Soils, Pumping, Fen, Marshes, Ditches, Natural streams, Runoff, Mole drainage, Rivers, Flow, Flood plains, Design criteria, Design flood, Flood frequency, Crop production, Topography, Outlets.
Identifiers: *Arterial drainage, *Field drainage, Underdrainage, Upland, Water gradients, Land level, Flood valleys.

Considered are the standards which the civil engineer should aim for in his design of arterial drainage so as to provide optimum conditions in different types of topography: fens and marshes, upland valleys, and flood valleys. The need to design for normal conditions as well as for peak flows is emphasized. The author remarks that arterial drainage in agricultural areas has hitherto been based on an arbitrary flood flow and a freeboard, for which design values have no basis. Needed for any satisfactory drainage project is provision for underdrainage. Underdrainage is successful in most soils only if there are sufficient cracks through which the water can flow. Particularly under arable farming, these cracks often must be made artificially under appropriate soil moisture conditions. Even in flood times, the cracks must not become waterlogged. With the aid of a block-up underdrainage outfall taken from the side of a ditch in which there had been regular fluctuations in water level, the need to keep the normal water level below the underdrainage is emphasized. Two examples of how to grade and site field drains are considered. This paper is intended to enable civil engineers to design arterial

drainage schemes giving optimum conditions for field drainage without acquiring a comprehensive knowledge of that subject. (Bell-Cornell)
W75-08731

A 'RATIONAL' POLICY FOR THE ENERGY AND ENVIRONMENTAL CRISES,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W75-08732

APPARATUS FOR SUBSOIL IRRIGATION,
For primary bibliographic entry see Field 3F.
W75-08748

CONTROL APPARATUS FOR A WATER SUPPLY SYSTEM,
Weil-McLain Co., Inc., Dallas, Tex. (assignee)
For primary bibliographic entry see Field 8C.
W75-08749

MECHANICAL ELIMINATION OF AQUATIC GROWTHS,
For primary bibliographic entry see Field 5G.
W75-08761

COMPUTER USE FOR RIVER REGULATION,
Corps of Engineers, Portland, Oreg. Reservoir Control Center.
C. E. Abraham.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 101, No HY2, p 291-297, 1974. 3 fig, 6 ref.

Descriptors: *Reservoir releases, *Regulated flow, *Reservoir operation, *Computer programs, *Automation, Hydrologic systems, Streamflow forecasting, Routing, Reservoir storage, Simulation analysis, Data processing, *Columbia River, *River regulation.
Identifiers: SSARR computer program, HYSYS computer program, SYSREG computer program, Target elevation technique.

Computer programs, primarily mathematical models that represent the physical conditions of hydrologic, reservoir, and river systems, developed for the Columbia River area, have greatly advanced the ability to analyze hydrologic and reservoir systems. As opposed to planning study applications, real-time reservoir regulation and streamflow forecasting require answers to day-to-day operating problems. Some of the most important criteria for real-time scheduling programs are: (1) automation and flexibility with input and output functions, (2) ability to adjust the model within a simulation or from day-to-day, (3) generalized watershed, river and reservoir model including streamflow routing, and (4) convenience in application. A family of computer programs—the Streamflow Synthesis and Reservoir Regulation (SSARR) package—that meets these criteria is described. This package includes the SSARR program, and the Hydro-Power System Regulation Analysis (HYSYS) and System Reservoir Regulation (SYSREG) programs. The various hydrometeorological functions necessary in the package are computed by the storage routing procedure using short reaches or subreaches. Reservoir regulation is based on the target elevation technique, which is useful for carrying out optimum multi-purpose operations policies given actual constraints. It is impractical to provide logic that considers all operating contingencies, such as construction work, fish requirements, navigation accidents, etc. (Becker-Wisconsin)
W75-08776

STREAM CHANNELIZATION: THE ECONOMICS OF THE CONTROVERSY,
Cornell Univ., Ithaca, N.Y. Dept. of Economics.
For primary bibliographic entry see Field 6C.

W75-08777

DISCHARGE, SLOPE, BED ELEMENT RELATIONS IN STREAMS,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 2E.
W75-08794

ENVIRONMENTAL IMPACTS OF RESERVOIRS—A CASE STUDY,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W75-08796

FLOODLAND MANAGEMENT: THE ENVIRONMENTAL CORRIDOR CONCEPT,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 6F.
W75-08797

PILOT STUDY IN FLOOD PLAIN MANAGEMENT,
Washington State Univ., Pullman. R. L. Albrook Hydraulic Lab.
For primary bibliographic entry see Field 6F.
W75-08798

REGULATION OF LOW STREAMFLOWS,
Environmental Protection Agency, Cincinnati, Ohio.
C. R. Ownbey.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 241-247, 1973.

Descriptors: *Low flow, *Regulated flow, *Water quality, River flow, Dams, Benefits, Intangible benefits, Project benefits, Equalizing reservoirs, Flow control, Civil engineering, Environmental engineering, Environmental effects.

The regulation of low streamflows is taking its place in the planning and management of the nation's water resources, along with such time-honored purposes as flood reduction, navigation, power, and irrigation. As man's ability to alter the stream regimen increases with construction of storage reservoirs, the minimum streamflow becomes less dependent upon the vagaries of the natural hydrologic cycle and more dependent on deliberate decisions by the human planners and operators of systems. It is therefore the decision-making process that must be examined and improved. In many of the nation's river basins, water resource management is evolving from construction phase to operating phase; this alters the direction but not the importance of the decision-making process. Government employees at all levels of government have interlocking responsibilities in decision-making. Private citizens also play a role in the day-to-day process, that goes beyond the casting of votes on election days. The civil engineer has both opportunity and responsibility to continue to exert a major voice. But the day is passing when the engineer's recommendations were accepted docilely in decisions concerning public works projects. He will be a member—hopefully, a guiding member—of interdisciplinary teams. (See also W75-08786) (Sims-ISWS)
W75-08808

RESERVOIR OPERATION USING SNOW SURVEY DATA,
Soil Conservation Service, Bozeman, Mont.
P. E. Farnes.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society

of Civil Engineers, New York, p 249-258, 1973. 3 fig, 2 tab.

Descriptors: *Reservoirs, *Reservoir operation, *Snowmelt, *Regulated flow, Multiple-purpose reservoirs, Reservoir storage, Management, Hydraulics, Inflow, Reservoir releases, Floods, Snow surveys, Forecasting, Snowpacks, Runoff, Melt water, Precipitation(Atmospheric), *Montana.
Identifiers: Hebgen Lake(Mont).

Measurements of the snowpack stored on the mountainous watersheds of the West are used to forecast the amount of streamflow expected from snowmelt. Forecasts can be improved by including the ammount of moisture stored in the soil beneath the snowpack and an estimate of subsequent precipitation. A combination of the three variables--snow water equivalent, soil moisture, and spring precipitation--in their proper weight provides a method for making an accurate prediction of runoff 3 to 6 months in advance. The forecasts are used by irrigators, reservoir operators, municipalities, industry, and many others to evaluate the potential water supply. The use of these procedures was illustrated by a discussion of the operation of the Hebgen Lake on the Madison River in southwestern Montana. Flows during the 1972 runoff were kept within desirable limits below the dam. Without the benefit of a reservoir management plan, flood damages could have been excessive and one of the largest experienced on the Madison River. (See also W75-08786) (Sims-ISWS)
W75-08809

PHYSICAL AND BIOLOGICAL REHABILITATION OF A STREAM,
Montana State Univ., Bozeman. Dept. of Fisheries.
R. J. Luedtke, F. J. Watts, M. A. Brusven, and T. E. Roberts.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 259-267, 1973. 9 ref.

Descriptors: *Streams, *Sediment transport, *Benthic fauna, *Gabions, Insects, Gravels, Sands, Silts, Streamflow, Stream improvement, Rehabilitation, Structures, Hydraulic structures, Scour, Sediments, On-site investigations, *Idaho.
Identifiers: Log jams, Log drops, Riffles, *Emerald Creek(Ida).

This study was conducted on the East Fork and main stem of Emerald Creek, a tributary of the St. Maries River in northern Idaho. The lower reach of Emerald Creek is rather heavily polluted with sand and silt as a result of private and commercial mining of garnets and garnet sand. Gabions were constructed in the lower reaches of the main stem of Emerald Creek. Both test sites were located in heavily silted runs extending over 300 feet in length. The structures were built to contrict channel width, thereby increasing current velocity, riffle length, sediment transport, and insect drift. In general, the net effect of the gabion constrictors was positive. Riffle conditions were extended for about 75 feet. Species and diversities were effective indicators of physical changes in the bed. There was a rapid and pronounced faunal shift from slow water forms of insects to riffle species in the high velocity zone created by the gabions. Trout were observed to move into the scoured areas. Fluorescent tagging techniques were used to determine sediment transport during the winterspring high flow regime in Emerald Creek. Transport of sand and fine gravel, pebble and cobble was studied at four sites. Results of tagged sediment studies indicate that Emerald Creek has the capability of transporting large quantities of sediments, and would readily return to premining conditions if the sources of excess sediment were eliminated. (See also W75-08786) (Sims-ISWS)

W75-08810

SEDIMENT TRANSPORT SYSTEM IN A GRAVEL-BOTTOMED STREAM,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 2J.
W75-08812

PREDICTING LOW FLOWS AND FLOODS FROM UNGAGED DRAINAGE BASINS,
Washington State Univ., Pullman. Dept. of Civil Engineering.
J. F. Orsborn.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 383-394, 1973. 8 fig, 1 tab, 14 ref, 1 append.

Descriptors: *Low flow, *Flood flow, *Streamflow forecasting, Regression analysis, Correlation analysis, Forecasting, Runoff forecasting, Floods, Hydrology, Streamflow, Surface waters, Flood forecasting, Design flood, Geomorphology, Methodology, Washington.

A study was conducted to develop methodology for determining the quantity (hydrologic), quality, and economic procedures for establishing minimum streamflows. The resultant hydrologic-geomorphic method of determining not only the average low flow value at a particular point, but also the natural discharge-recurrence interval graph for ungaged streams was presented. The relationships developed are valid for both small and large drainage basins. Some anomalies still exist but these can be exposed by balancing predicted flows against downstream gaged flows, by field checking and/or by miscellaneous streamflow records. The predicted values are generally very accurate compared with stream gaging records which were not used to generate the prediction graphs. A similar method of analysis was applied to flood flows from ungaged basins with equally good results. Intermediate steps for determining relationships of flood flows to geomorphic parameters are not yet as well defined as for low flows. (See also W75-08786) (Sims-ISWS)
W75-08820

ESTIMATION FLOODS SMALL DRAINAGE AREAS IN MONTANA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
E. R. Dodge.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 395-407, 1973. American Society of Civil Engineers, New York, p 395-407, 1973. 5 fig, 3 tab, 11 ref, 1 append.

Descriptors: *Floods, *Flood forecasting, *Streamflow forecasting, *Estimating equations, Estimating, Regression analysis, Correlation analysis, Runoff forecasting, Hydrology, Streamflow, Flow, Design flood, Methodology, Watersheds(Basins), *Montana, Small watersheds.

The estimation of flood magnitudes for various recurrence intervals which may be expected from small ungaged rural watersheds is a rather common problem in engineering practice. A study to provide a method for predicting the magnitude and frequency of floods from small drainage areas in Montana for culvert design practice was described. The highway engineer needs a method of flood prediction which is based upon data readily available to him and which can be applied with relative ease in a routine manner. It was decided to use a combination of regional analysis to estimate flood frequency curves for flood regions of the

state and a stepwise multiple regression analysis technique to relate flood peaks for a given recurrence interval to watershed parameters for each region. It appeared that this method would produce the most reliable results since it would be based on actual flood records, hopefully with their reliability optimized through regional analysis. Flood records through 1969 were available for 230 watersheds which had at least 10 years of record with upstream diversion not affecting flood peaks. The primary focus of this study was on small watersheds. The equations developed for flood prediction are as valid as 1969 data permit for drainage areas in Montana within the range of about 1 to 1000 sq mi. (See also W75-08786) (Sims-ISWS)
W75-08821

CHANNEL AGGRADATION IN WESTERN UNITED STATES AS INDICATED BY OBSERVATIONS AT VIGIL NETWORK SITES,
Geological Survey, Boise, Idaho. Water Resources Div.
For primary bibliographic entry see Field 2J.
W75-08830

INDEX TO MAPS TO FLOOD-PRONE AREAS IN INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7C.
W75-08834

WATER RESOURCES OF INDIAN RIVER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
L. J. Crain, G. H. Hughes, and L. J. Snell.
Open-file report 75-66, 1975. 98 p, 38 fig, 5 tab, 14 ref.

Descriptors: *Water resources, *Florida, *Surface waters, *Groundwater, Aquifers, Water supply, Hydrologic data, Water yield, Streamflow.
Identifiers: *Indian River County(Fla).

The water resources of Indian River County, on the Atlantic coast in southern Florida, are described. About half the county is developed; pasture and citrus groves predominate. The population tripled during 1950-70, from 11,872 to 35,992. Water use, largely for agriculture, is about four times the average per capita use in Florida. About 135 mgd was withdrawn in 1970 from ground- and surface-water bodies in the county. Only 3 mgd was for public water supply. Rainfall at Vero Beach averages 51.3 inches, almost two-thrids of it during the summer and early autumn. Large streams do not exist. A shallow aquifer consisting of sand, shell, and some silt and clay, is present in all of the county, its base reaching depths of 150 feet. The aquifer is underlain by the Hawthorn Formation which acts as a confining bed to retard upward movement of water from the underlying Floridan aquifer. Water from the shallow aquifer is of good quality. The Floridan aquifer underlies the county at a depth of 300 to 600 feet. Throughout much of the county withdrawals of water for irrigation use appear to have caused a decline of 10 to 15 feet in the level of the potentiometric surface of the Floridan aquifer over a 20-year period. A high chloride concentration is the common objectionable characteristic of Floridan-aquifer water. In spite of its high chloride concentration, the water has proved valuable; water having chloride concentrations as high as 2,000 mg/liter has been used for irrigation. About 420 million gallons per day surface water is available for development in the county. (Knapp-USGS)
W75-08836

EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg.

Journal of the Urban Planning and Development Division, ASCE, Vol. 101, No. UP1, Proceedings paper No 11324, p 61-75, May 1975. 6 fig, 1 tab, 32 ref. OWRT B-086-COLO(2).

Descriptors: *Urban drainage, *Projects, *Planning, *Flood control, *Economics, *Social participation, Cost-benefit analysis, Evaluation, Optimization, Expenditures, Water quantity, Decision making, Methodology, Rainfall, Intangible costs, Intangible benefits, Systems analysis. Identifiers: Cost minimization, Benefit maximization, Public works, Public funds, Social benefits, Implementation.

Public works problems associated with evaluation and implementation situations are described. By clarifying criteria and evaluation methodologies, a large amount of uncertainty can be eliminated and public dollars can be saved. Urban drainage and flood control (UDFC) must compete for funding from the limited public purse. Evaluation problems include: (1) determination of the merit of individual projects; (2) ranking of competing UDFC projects to determine priorities; (3) determination of optimal investment timing; and (4) determination of the incidence of costs and benefits on different population sectors so that project costs can be equitably apportioned. UDFC systems are identified as minor and major. The former provides substantial flood damage reduction benefits, and the latter furnishes intangible benefits. Economic evaluation procedures must provide necessary information for financing and implementation. The state-of-the-art of evaluation capability is discussed and the use of minimum cost and benefit maximization criteria in the selection of UDFC projects for implementation is considered. In the case of the major flood control project, attention has been focused on the potential reduction in flood damages. All public programs, e.g., public safety, water supply library services, urban drainage and flood control, and others should be subjected to the type of analysis presented to identify precisely the benefits from expenditures of public funds and the recipients of the benefits. (Bell-Cornell)
W75-08847

4B. Groundwater Management

REGIONAL PROBLEM ANALYSIS IN THE PACIFIC NORTHWEST: PART A-INSTREAM FLOW NEEDS; PART B-BASALT AQUIFERS; PART C-WILD AND SCENIC RIVERS. Washington State Water Research Center, Pullman. For primary bibliographic entry see Field 6B. W75-08356

WATER RESOURCES DEVELOPMENT IN THE MULLICA RIVER BASIN, Rutgers - the State Univ., New Brunswick, N.J. Dept. of Zoology. J. B. Durand, M. L. Granstrom, and N. S. Rudolph. Water Resources Bulletin, Vol 10, No 2, p 272-282, April 1974. 4 fig, 1 tab, 4 ref. OWRR A-018-NJ(5), B-014-NJ(7), and B-018-NJ(5).

Descriptors: River basins, Estuaries, *Withdrawal, *Linear programming, *Water supply, *Conjunctive use, Environmental effects, *Salinity, Simulation analysis, Groundwater, Surface waters, Water utilization, Streamflow, Fish, Humid areas, *New Jersey, Droughts, Long-term planning, Biology, Mathematical models, Systems analysis. Identifiers: Chance-constrained programming, *Mullica River-Great Bay Estuary(New Jersey).

The potentiality of withdrawing water from the Mullica River-Great Bay Estuary in southern New Jersey prompted a joint study of biologists and engineers to determine the maximum supply of water that could be diverted from the basin without causing harmful environmental effects. The consequence of removing water from the basin over long periods of time was simulated by review records of a severe drought. It was proposed to develop a salinity regime for the estuary such that minimal disturbance of the estuary would result. Based on the analysis of streamflows and salinities during the drought conditions, minimum mean monthly streamflows were determined corresponding to the maximum salinities tolerable by the fish and shellfish communities, important sources for revenue and recreation in the region. Engineering consideration was given only to possibilities of conjunctive use, either by direct diversions of flow from the streams, pumping from wells, or a combination of these. A physically-optimized, chance-constrained linear programming model was developed for the conjunctive use of ground and surface waters. Adjusting water withdrawal from streamflow and groundwater sources according to physical and seasonal criteria would permit maximum use of the basin's resources with no additional burden on the ecology of the estuary. While the model was applied to the Mullica River Basin, it could also be applied to other areas of humid climatology. (Bell-Cornell)
W75-08386

AN APPLICATION OF PARAMETRIC STATISTICAL TESTS TO WELL-YIELD DATA FROM CARBONATES OF CENTRAL PENNSYLVANIA, Pennsylvania State Univ., University Park. S. H. Siddiqui, and R. R. Parizek. Journal of Hydrology, Vol 21, No 1, p 1-14, January 1974. 1 fig, 4 tab, 11 ref. OWRR A-005-PA(7).

Descriptors: *Water yield, *Hydrogeology, *Statistical methods, Carbonate rocks, Fractures(Geologic), Structural geology, *Pennsylvania, Aquifer characteristics. Identifiers: Factor analysis.

Variation in productivity (yield in gallons per minute per foot of drawdown per foot of saturated thickness) of 80 water wells located in folded and faulted carbonate rocks and shales of Cambro-Ordovician age in central Pennsylvania, was studied in relation to six hydrogeologic factors. Parametric and nonparametric statistical techniques were applied. Productivity values were transformed to common logarithms, and it was assumed that a long-normal model would reasonably describe the variation in productivity, especially as the sample size was increased. The variations in number of fracture traces, rock type, dip of bedrock strata and topography were significant, and variation in depth to water table was not significant in accounting for variation in well yield. Student t-test showed that anticlinal wells were significantly different from synclinal wells. However, wells in the same rock type but different structural settings were not significantly different. This shows that variations in rock type and number of fracture traces are more important than other structural variations. Both parametric and nonparametric tests gave identical results, which justifies the use of parametric tests which require normally distributed data. (Knapp-USGS)
W75-08388

HYDROGEOLOGY OF THE EDMONTON AREA (NORTHWEST SEGMENT), ALBERTA, Alberta Research, Edmonton. R. Bibby. Report 74-10, 1974. 10 p, 1 fig, 55 ref.

Descriptors: *Hydrogeology, *Maps, *Groundwater, Areal hydrogeology, Topography, Geologic mapping, Drainage, Climates, Meteorology, Geology, Aquifers, Water chemistry, *Canada. Identifiers: *Edmonton area(Alberta).

The topography of the Edmonton area is predominantly level to gently rolling. The area is drained by the North Saskatchewan and Sturgeon Rivers. The area has a cold, humid continental climate, receiving 17.5 inches of precipitation on average each year, 70% as rain. Most of the area is covered by glacial materials (mainly till), clay, and silt. Buried valleys are coincident with the two main rivers and contain sand and gravel deposits which are in hydraulic connection with the rivers. Yields are fairly high in the sand and gravel aquifers of the drift, particularly those in connection with the rivers. Groundwater flow systems in the upper 300 feet are largely controlled by the connection between the rivers and buried valley sand and gravel deposits, and by the incised nature of the valleys. The chemistry of the groundwaters shows a marked correlation with soil type and drift lithology. Groundwaters in areas covered by till, clay, and silt are typified by the presence of sulfate and higher total dissolved solids. The exchange of calcium for sodium as flow passes from the drift to the bedrock is pronounced and some sulfate reduction occurs in the bedrock. (Sims-ISWS)
W75-08398

HYDROGEOLOGY OF THE GLEICHEN AREA, ALBERTA, Alberta Research, Edmonton. G. F. Ozoray, and A. T. Lytviak. Report 74-9, 1974. 16 p, 1 fig, 58 ref, 1 append.

Descriptors: *Hydrogeology, *Maps, *Groundwater, Areal hydrogeology, Geologic mapping, Topography, Drainage, Climates, Meteorology, Geology, Aquifers, Water chemistry, *Canada. Identifiers: *Gleichem area(Alberta).

The hydrogeology of the uppermost 1000 feet of strata in the Gleichem area was described. Maps and profiles were constructed from existing data and from data collected by a field survey and drilling and testing operations. The 20-year safe yields range from 1 igpm (about 5 1/min) to more than 100 igpm (about 450 1/min). The best aquifers are Quaternary sands and gravels and Upper Cretaceous Belly River sandstones. Water quality varies: total dissolved solids range from less than 1000 to more than 5000 ppm, and the general chemical character of the water varies from Ca/HCO3 type to Na/SO4 type. In the deep Milk River sandstones in the southeast corner of the map area, Na/Cl type waters are present. (Sims-ISWS)
W75-08399

ANALYSIS OF PUMPING TEST DATA FROM ANISOTROPIC UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE, Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water. For primary bibliographic entry see Field 2F. W75-08434

INVESTIGATION OF VERTICAL GROUND-WATER FLOW IN BOREHOLES, International Hydrological Decade, New Delhi (India). Indian National Committee. For primary bibliographic entry see Field 2F. W75-08450

DISTRIBUTION, CULTIVATION AND CHEMICAL DESTRUCTION OF GALLIONELLA FROM ALABAMA GROUND WATER, Alabama Univ., University. Dept. of Microbiology. For primary bibliographic entry see Field 5B. W75-08479

MEASUREMENT OF THE HORIZONTAL COMPONENT OF GROUND WATER FLOW USING A VERTICALLY POSITIONED IN-SITU THERMAL PROBE,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 2F.
W75-08490

EVALUATION OF RECHARGE POTENTIAL NEAR INDIO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. A. Moreland.
Available from NTIS, Springfield, Va 22161 as PB-241 466, $3.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 33-74, February 1975. 36 p, 11 fig, 3 tab, 9 ref.

Descriptors: *Artificial recharge, *Water reuse, *Waste water disposal, *California, Infiltration, Pit recharge, Recharge ponds, Hydrogeology.
Identifiers: *Indio(Calif).

The feasibility of utilizing sewage effluent to recharge the groundwater in a 25-square mile area northwest of Indio, Calif., was evaluated. The depth to water in the area ranged from about 50 feet to more than 200 feet. Dissolved-solids concentrations were greater than 500 milligrams per litre in the shallow aquifers in the eastern and southern parts of the area. The permeability of the shallow sediments ranges from 15 to 50 feet per day. The eastern part of the area is underlain by fine-grained sediments that effectively separate the deep and shallow aquifers and would not be conducive to artificial recharge. In the western part of the area, sediments in the upper 100 feet are primarily sand. Considering all but economic factors, the most hydrologically favorable area for recharge is west of Washington Street and north of the Whitewater River. Using three spreading pits on a rotating basis and assuming long-term infiltration rates of 2 feet per day, an area of 33 acres would be required to infiltrate 8,000 acre-feet per year. At the recharge site, a water-level rise of about 36 feet due to recharge is expected. (Knapp-USGS)
W75-08493

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1972-73,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W75-08498

BASIC GROUND-WATER DATA FOR THE MOSCOW BASIN, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2F.
W75-08499

CHEMISTRY OF SUBSURFACE WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-08506

ESTIMATED YIELD OF FRESH-WATER WELLS IN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-08507

GROUND-WATER CONDITIONS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08509

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE CHERRYFIELD-JONESBORO AREA, MAINE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08510

WATER RESOURCES OF THE CROW RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08511

WATER RESOURCES OF THE BLUE EARTH RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08513

WATER RESOURCES OF THE CLINTON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08514

CHEMICAL QUALITY OF GROUND WATER IN THE WESTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5B.
W75-08515

SALINE GROUND-WATER RESOURCES OF LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W75-08517

GEOELECTRICAL POSSIBILITIES OF DETECTING STREAM CHANNELS IN CARBONATE ROCKS,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 2F.
W75-08603

GEOTHERMAL EXPLORATION,
Atlantic Richfield Co., New York. (assignee)
J. E. Hardison.
US Patent No 3,874,232, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 81, April 1, 1975.

Descriptors: *Patents, *Geothermal studies, *Thermal studies, *Temperature, Geology, Borehole geophysics, Exploration, Subsurface investigations, Thermal conductivity.
Identifiers: *Probes, Thermisters.

A uranium prospecting system is based on the determination of temperature anomalies in the earth's crust. The earth heat flux is measured at preselected points in shallow boreholes in order to detect heat given off as a result of radioactive decay. Localized anomalies are indicative of concentrations of radioactive materials. The temperature measuring apparatus is comprised of a tubular probe having temperature sensors at vertically spaced positions. The temperature sensors are thermistors contained in discs that extend laternally about the probe. Decentralizer means are attached to the probe and are designed to be remotely actuated from the surface. When the decentralizer is actuated, the sensors are forced into contact with the walls of the borehole at preselected sample points. The probe is left in position until thermal equilibrium is established with the sensors and then the desired temperature readings are taken. The temperature measuring apparatus can also be used to make conductivity measurements. (Sinha-OEIS)

W75-08616

GEOTHERMAL HEAT EXHANGE METHOD AND APPARATUS,
C. K. Greene.
US Patent No 3,874,174, 4 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 62, April 1, 1975.

Descriptors: *Patents, *Geothermal studies, *Brines, *Heat exhangers, Powerplants, Electric powerplants.
Identifiers: Sonic energy.

A method of generating power includes establishing two deep wells adjacent each other into a pool of hot brine beneath the earth's surface. Heat exchange apparatus is enclosed within each of the wells. Hot brine is circulated upward in one of the wells and thence downward in the other well. Vapor is created within each of the heat exchange units from the hot brine and is utilized to produce power by appropriate power generating equipment. The vapor is condensed during and after the power generation and returned to the heat exchange unit. Sonic energy is directed into each of the wells so as to constantly agitate the interior so as to dispel any scale which may bend to form on either the interior of the well casing or on the heat exchange apparatus. (Sinha-OEIS)
W75-08618

GEOLOGY OF GEOTHERMAL TEST HOLE GT-2, FENTON HILL SITE, JULY 1974,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5A.
W75-08649

DEEP ROCK NUCLEAR WASTE DISPOSAL TEST: DESIGN AND OPERATION,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 5E.
W75-08656

ON THE SELECTION OF A GROUND DISPOSAL SITE FOR RADIOACTIVE WASTES BY MEANS OF A COMPUTER,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5G.
W75-08665

ASPECTS OF HYDROLOGICAL EFFECTS OF URBANIZATION.
American Society of Civil Engineers, New York. Task Committee on the Effects of Urbanization on Low Flow, Total Runoff, Infiltration, and Ground-Water Recharge.
For primary bibliographic entry see Field 4C.
W75-08697

CARBON 14 DATING OF GROUNDWATER FROM CLOSED AND OPEN SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W75-08707

AN APPROXIMATE INFINITE CONDUCTIVITY SOLUTION FOR A PARTIALLY PENETRATING LINE-SOURCE WELL,
Bureau de Recherches Geologiques et Minieres, Orleans (France).
A. C. Gringarten, and H. J. Ramey, Jr.
Society of Petroleum Engineers Journal, Vol 15, No 2, p 140-148, April 1975. 4 fig, 4 tab, 35 ref, 2 append.

Descriptors: *Wells, *Pressure head, *Unsteady flow, *Mathematical studies, Equations, Subsurface investigations, Artesian wells, Hydraulics,

Groundwater potential, Flow, Pumping, Analytical techniques, Steady flow, Laminar flow, Boundaries(Surfaces).
Identifiers: Partial penetrating wells, Line-source well, Restricted entry wells, Wellbore.

A review of previous studies of transient flow to partially penetrating wells was made. All analytical studies involved the assumption of a constant flux along the open interval. This analytical study was a new solution that closely approximates an infinite-conductivity line source (constant pressure along the producing interval). (Prickett-ISWS)
W75-08715

ENVIRONMENTAL GEOLOGY--AN AID TO GROWTH AND DEVELOPMENT IN LAUDERDALE, COLBERT AND FRANKLIN COUNTIES, ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-08718

ENGINEERING ECONOMICS OF RURAL SYSTEMS: A NEW U S APPROACH,
National Water Well Association, Columbus, Ohio; and Rice Univ., Houston, Tex.
For primary bibliographic entry see Field 4A.
W75-08723

METHOD OF RECOVERING GEOTHERMAL ENERGY,
Mobil Oil Corp., New York. (assignee)
J. L. Fitch.
U.S. Patent No. 3,863,709, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 159, February 4, 1975.

Descriptors: *Patents, *Groundwater, *Geothermal studies, Energy, Wells, Heated water, Thermal water, Heat flow.

A method and system is disclosed for recovering geothermal energy from a subterranean geothermal formation having a preferred vertical fracture orientation. At least two deviated wells are provided which extend into the geothermal formation in a direction transversely of the preferred vertical fracture orientation and a plurality of vertical fractures are hydraulically formed to intersect the deviated wells. A fluid is injected via one well into the fractures to absorb heat from the geothermal formation and the heated fluid is recovered from the formation via another well. (Sinha-OEIS)
W75-08736

PITLESS WATER SYSTEM,
For primary bibliographic entry see Field 8B.
W75-08750

ARTIFICIAL RECHARGE IN THE URBAN ENVIRONMENT--SOME QUESTIONS AND ANSWERS,
California Univ., Davis. Dept. of Water Science and Engineering.
V. H. Scott, W. E. Johnston, and J. C. Scalmanini.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 409-415, 1973.

Descriptors: *Artificial recharge, *Multiple-purpose projects, *Recreation facilities, *Recharge ponds, Recharge, Induced infiltration, Water management(Applied), Multiple-purpose reservoirs, Groundwater recharge, Cities, Groundwater, Surface waters, Infiltration rates, Aquifers, Ponds, Recreation, Management, Maintenance, California.
Identifiers: *Recharge ponds maintenance.

In many areas, comprehensive management of urban water supplies requires that surface and groundwater supplies be integrated. An essential component of management programs can be artificial recharge for aquifer replenishment while minimizing land subsidence and preventing impairment of water quality. All the design variables which affect a potential multipurpose facility must be considered. Artificial recharge pond design can accommodate both good infiltration and other purposes. If alternate sources of water with various solids content are available for recharge, use of the water with the lowest solids content will give the best infiltration and longest cycles between pond maintenance. The attitudes of water districts, managers, and homeowners sampled tend to favor multiple-use facilities, especially in urban areas; and a good, positive attitude can be maintained if designs are both aesthetic and functional. Effective management of water resources as it relates to artificial recharge, especially in urban areas, requires a mutual understanding of objectives by both water agencies and other interests. Funds may be available from state and federal agencies to assist or support the multipurpose aspects of an artificial recharge facility, and aid of this type should both promote consideration and increase the attractivness of potential multipurpose projects. (See also W75-08786) (Sims-ISWS)
W75-08822

RESEARCH AND ADVANCES IN GROUNDWATER RESOURCES STUDIES, 1964-1974,
Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 2F.
W75-08825

ONE-DIMENSIONAL SIMULATION OF AQUIFER SYSTEM COMPACTION NEAR PIXLEY, CALIFORNIA: 1. CONSTANT PARAMETERS,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 2F.
W75-08826

WASTEWATER RECLAMATION AND RECHARGE, BAY PARK, N.Y.,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5D.
W75-08827

BOUGUER GRAVITY ANOMALY MAP OF THE TEMECULA AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 7C.
W75-08831

WATER RESOURCES OF INDIAN RIVER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W75-08836

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF URBANIZATION ON WATER QUALITY,
Water Resources Engineers, Inc., Springfield, Va. and DeKalb County Planning Dept., Decatur, Ga.
For primary bibliographic entry see Field 5B.
W75-08351

REGIONAL WATER EXCHANGE FOR DROUGHT ALLEVIATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.

W75-08403

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT-PHASE II,
Washington Cooperative Fishery Unit, Seattle.
For primary bibliographic entry see Field 5B.
W75-08468

POTENTIAL FLOOD HAZARD--NORTH AVENUE AREA, DENVER FEDERAL CENTER, LAKEWOOD, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4A.
W75-08496

DETERMINATION OF URBAN WATERSHED RESPONSE TIME,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
E. F. Schulz, and O. G. Lopez.
Hydrology Papers, No 71, December 1974. 41 p, 6 fig, 11 tab, 74 ref, 2 append. Contract DACWO 5-73-C-0029.

Descriptors: *Unit hydrographs, *Urbanization, *Statistical methods, *Watersheds(Basins), Time lag, Time of concentration, Parametric hydrology, Small watersheds, Regression analysis, *Colorado, Hydraulics, Hydrology, Rainfall, Floods, Runoff, Channels, Peak discharge, Drainage systems, Data processing, Discharge(Water), Hydrologic aspects.
Identifiers: *Response time, *Denver(Colo), Hydraulic capacity, *Urban watersheds.

A brief review of previous work was presented. Different methods for quantifying urbanization were discussed. A stepwise multiple regression technique was used to select the best parameter of urbanization. The rainfall and flood events from nine urban watersheds in the Denver Metropolitan region were analyzed. Unit hydrographs were derived from the measured floods on these watersheds. The unit hydrograph parameters were correlated with storm and physical watershed parameters. It was found that the changes in the unit hydrograph in the urban region were related to the decrease in the watershed response time. The best way of defining the response time was the lag time. The lag time was found to be sensitive to the increase in the hydraulic capacity to the decrease in the ratio of pervious watershed and the shape of the watershed. (Dawes-ISWS)
W75-08685

ASPECTS OF HYDROLOGICAL EFFECTS OF URBANIZATION.
American Society of Civil Engineers, New York. Task Committee on the Effects of Urbanization on Low Flow, Total Runoff, Infiltration, and Ground-Water Recharge.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY5, Proceedings Paper 11301, p 449-468, May 1975. 2 fig, 89 ref, append.

Descriptors: *Urban hydrology, *Hydrologic cycle, *Urban runoff, *Infiltration, *Groundwater recharge, *Urbanization, Water resources development, Low flow, Runoff, Infiltration rates, Saline water intrusion, Hydrologic aspects, Social aspects, Water supply, Land use.

Urbanization both alters and complicates the natural hydrologic cycle. However, the effects are often not consistent, but depend on the nature and magnitude of the urban influence. The effects of urbanization on four aspects of the hydrologic cycle were examined: (1) low flow, (2) total runoff, (3) infiltration, and (4) groundwater recharge. Both supporting data and a selected bibliography were provided. Inherent in the alteration of the hydrologic cycle by urbanization is the contamina-

tion by urban wastes, and the consequent pollution of the water resource. (Prickett-ISWS)
W75-08697

REHABILITATION OF A CHANNELIZED RIVER IN UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W75-08787

4D. Watershed Protection

WATERSHED ORGANIZATIONS - IMPACT ON WATER QUALITY MANAGEMENT, AN ANALYSIS OF SELECTED MICHIGAN WATERSHED COUNCILS,
Michigan State Univ., East Lansing. Dept. of Resources Development.
For primary bibliographic entry see Field 5G.
W75-08354

EROSION MODELING ON A WATERSHED,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2J.
W75-08459

RESERVOIR OPERATION USING SNOW SURVEY DATA,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 4A.
W75-08809

WINTER STORM AND FLOOD ANALYSES, NORTHWEST INTERIOR,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-08818

CALIBRATION OF WATERSHED WETNESS AND PREDICTION OF FLOOD VOLUME FROM SMALL WATERSHEDS IN HUMID REGION,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 2A.
W75-08819

ESTIMATION FLOODS SMALL DRAINAGE AREAS IN MONTANA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4A.
W75-08821

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

PROBIT TRANSFORMATION: IMPROVED METHOD FOR DEFINING SYNCHRONY OF CELL CULTURES,
Carnegie Institution of Washington, Stanford, Calif. Dept. of Plant Biology.
W. G. Hagar, and T. R. Punnett.
Science, Vol 182, No 4116, p 1028-1030, December 7, 1973. 1 fig, 1 tab, 15 ref.

Descriptors: *Cultures, *Cytological studies, *Statistical methods, Computer programs, Data processing, Equations.
Identifiers: *Synchrony, *Chlorella pyrenoidosa, Data interpretation, *Probit transformation.

Cell numbers can be converted to probits that are used to compare the degree and timing of synchronized cell cultures. The solution follows from the fact that the change in the rate of cell division follows a normal distribution function, with the maximum rate of cell divison at the mid-point of the curve. The time curve for the total cell number is the integral of the cell division rates up to that time and, therefore, has the same shape as the integral of a normal probability curve. For this reason, the sigmoidal growth curves from various experiments can be easily compared by converting the cell numbers to probits. In the case of cell division, and plot of probit against time produces a straight line having a midpoint corresponding to the peak of the cell division rate with reciprocal of the slope equaling the standard deviation of the cell release rate. These two parameters are all that are needed to define degree of synchrony. Data from synchronous cultures of Chlorella pyrenoidosa have been analyzed by this method by means of a readily available computer program. The method can be used with any biological system that generates normal sigmoidal data. (Little-Battelle)
W75-08378

REDESCRIPTION OF GAETANUS INTERMEDIUS CAMPBELL (CALANOIDA: COPEPODA) FROM THE TYPE LOCALITY,
Washington Univ., Friday Harbor. Friday Harbor Lab.
For primary bibliographic entry see Field 2L.
W75-08380

TEMPERATURES SELECTED SEASONALLY BY FOUR FISHES FROM WESTERN LAKE ERIE,
Ohio State Cooperative Fishery Unit, Columbus.
For primary bibliographic entry see Field 5C.
W75-08381

A HIGHLY SENSITIVE AUTOMATED TECHNIQUE FOR THE DETERMINATION OF AMMONIUM NITROGEN,
Ruakura Soil Research Station, Hamilton (New Zealand).
M. W. Brown.
Journal of the Science of Food and Agriculture, Vol 24, No 9, p 1119-1123, September 1973. 1 fig, 2 tab, 6 ref.

Descriptors: *Ammonium compounds, *Soils, *Automation, *Chemical analysis, Fertilizers, Water analysis, Soil analysis.
Identifiers: *Ammonium nitrogen, Phenol hypochlorite reaction, Autoanalyzer, Catalytic methods, Reproducibility, Sample preparation, Method validation.

The catalytic action of nitroprusside on the phenol hypochlorite reaction has been utilized to design a more sensitive automated technique for determining ammonium nitrogen in soil extracts. The method gives reproducible results in close agreement with manual methods. Sensitivity is such that as little as 0.1 ppm of N in solution can be determined without the use of recorder range expansion. Using this procedure, 10 g of air-dried soil were shaken for one hour with 100 ml 2 M-potassium chloride. The supernatant extract was fed into the analyzer without prior filtration, along with standard solutions. Where the anticapated level of nitrogen was greater than 4 ppm, the soil extract was first suitably diluted with 2 M-potassium chloride. Agreement between the two sets of results is very good. Statistical tests, Student's t, show there is no significant difference between the two sets of results even at the 20 percent probability level. Experience with the basic phenol hypochlorite method strongly suggests that the method would also be suitable for the analysis of fertilizers and natural waters. (Mortland-Battelle)
W75-08382

STEREO-SCANNING ELECTRON MICROSCOPY OF DESMIDS,
Colorado Univ., Boulder. Dept. of Molecular, Cellular and Developmental Biology.
J. D. Pickett-Heaps.
Journal of Microscopy, Vol 99, No 1, p 109-116, September 1973. 8 fig, 12 ref.

Descriptors: *Systematics, *Chlorophyta, Electron microscopy, Speciation.
Identifiers: *Scanning electron microscopy, *Sample preparation, Staurastrum manfeldtii, Staurastrum gracile, Staurastrum pingue, Cosmarium botrytis, Micrasterias thomasiana, Micrasterias sol, Fixation, Sample preservation, *Desmids.

Stereo-pairs of scanning electron micrographs are presented of two species of Staurastrum, one species of Cosmarium and two species of Micasterias, including the triradiate, diploid variant of M. thomasiana. Some specimens were treated with a relatively broad range polysaccharidase preparation called 'Glusulase', washed, and allowed to stand at room temperature for 1-1/2 h in culture medium before fixation. Cells were normally fixed in 1 percent glutaraldehyde made up in culture medium, for about 1 h at room temperature; after washing, they were post-fixed for up to 1 h in 1 percent osmium tetroxide, also made up in the culture medium. After post-fixation, the cells were suspended in water and collected on a small 'Millipore' filter. A suitable choice is the 'Solvinert' series of filter pads with pore sizes around 1.5 micrometers. The filter pad served as a mount for the cells. The material and mount were slowly dehydrated in acetone and then passed through the critical point drying (CPD) procedure. The dried specimens were mounted on specimen stubs using transfer or double-sided sticky tape. Thy were then coated quite heavily and omnidirectionally with 5.0 nm carbon and then 15.0 nm gold. Specimens were examined at 20 kV. For taking stereo-pairs, a difference in tilt of 12 degrees between successive micrographs was found empirically to give good results. Some typical morphological variations encountered in cultures are illustrated; the methods are reasonably quick and reliable and may prove useful in taxonomic studies of desmids. (Little-Battelle)
W75-08383

RELATIONSHIP OF VARIOUS INDICES OF WATER QUALITY TO DENITRIFICATION IN SURFACE WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. B. Owens, and D. W. Nelson.
Proceedings of the Indiana Academy of Science, Vol 82, p 404-413, 1972 (published 1973). 8 fig, 17 ref. OWRR A-019-IND(2).

Descriptors: *Surface waters, *Water chemistry, Rivers, Ponds, *Indiana, *Denitrification, *Nitrates, *Water quality, Waste water(Pollution), Dissolved oxygen, Bacteria, Phosphorus, Temperature, Hydrogen ion concentration, Nitrogen, Effluents, Water pollution sources, Waste assimilative capacity, Self-purification, Kinetics, Carbon, Municipal wastes, Industrial wastes.
Identifiers: *Wabash River(Indiana).

Water samples were collected monthly from 3 farm ponds and from 3 locations on the Wabash River near Lafayette, Indiana, to determine the actual and potential rates of denitrification in such water systems. Denitrification may serve as an important mechanism for nitrate removal from surface waters. Water parameters which may affect denitrification were estimated at the time of sampling and then related to the observed denitrification rates. Actual and potential denitrification rates were normally small unless an energy source was added, indicating that the low amount of dissolved carbon plus a high dissolved oxygen content may be the factors limiting denitrification in surface waters. Water temperature, pH, nitrate concentration, and number of denitrifying bacteria

appeared suitable for denitrification during most of the year. Higher levels of bacteria, nitrate, and phosphorus existed in the river than in the ponds, but the ponds contained slightly more dissolved carbon. The nitrate-N levels did not exceed the 10 ppm standard of the U.S. Public Health Service, and the river and pond surface waters remained aerobic throughout the year. Contaminant levels were little affected by the municipal and industrial effluents discharged between the river locations sampled. (Brown-IPC)
W75-08384

BIOLOGICAL METHODS FOR THE ASSESSMENT OF WATER QUALITY.
ASTM Special Technical Publication No. 528, 1973. 256 p, Illus, Maps.

Descriptors: *Bioassay, *Monitoring, Pollutant identification, Water quality, Biology.

This book contains the contributed papers presented at the symposium covering a variety of aspects involving biological methods for the assessment of water quality. One paper discusses the interaction of engineers and biologists in water quality management. Others discuss: pollutant bioassay using fish and mixing zone concepts; biological monitoring of the aquatic environment; bacteria and the assessment of water quality and the use of algae, especially diatoms, in the assessment of water quality; the use of aquatic invertebrates in the assessment of water quality; continuous-flow bioassays with aquatic organisms. A tentative proposal for a rapid in-plant biological monitoring system, rapid biological monitoring systems for determining aquatic community structure in receiving systems and use of toxicity tests with fish in water pollution control are studied. Several papers cover the following topics: assessment of fish flesh tainting substances; use of histologic and histochemical assessments in the prognosis of the effects of aquatic pollutants; stabilization oxygen demand; and microbiological inhibition testing procedure. The use of artificial substrate samplers to assess water pollution and mobile bioassay laboratories is discussed. Numerous illustrations are included throughout, and each contribution ends with a list of references.-- Copyright 1974, Biological Abstracts, Inc.
W75-08392

INDUSTRIAL WATER RESOURCES OF CANADA, THE HUDSON BAY, LABRADOR AND ARCTIC DRAINAGE BASINS, 1959-65,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
J. F. J. Thomas, and R. M. Gale.
Water Survey Report No. 15, 1973. 147 p, 3 fig, 6 tab, 7 ref, 3 append.

Descriptors: *Water quality, *Chemical analysis, *Canada, Surveys, Sampling, Water chemistry, Surface waters, Groundwater, Municipal water, Chemical properties, Hardness(Water), Basins, Arctic, Pollutant identification, Industrial wastes.
Identifiers: *Hudson Bay(Labrador).

This, the final part of the series of Water Survey Reports of the industrial water resources of Canada, dealt with the Hudson's Bay, Labrador, and Arctic drainage basins. Chemical analyses of waters from 216 stations were recorded, with descriptions of 49 municipal and 17 other water supplies. Records between 1947 and 1961 were included. The geology of the drainage basins, the procedures used, and the analytical techniques employed were summarized briefly. Two maps of the areas dealt with were supplied. The waters vary widely in hardness; mineral content is mainly alkaline earth bicarbonates; alkalies, sulphates and chlorides are for the most part low. (Sims-ISWS)
W75-08395

POLYNUCLEAR AROMATIC HYDROCARBONS IN RAW, POTABLE AND WASTE WATER,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
R. M. Harrison, R. Perry, and R. A. Wellings.
Water Research, Vol 9, No 4, p 331-346, April 1975. 2 fig, 20 tab, 147 ref.

Descriptors: *Pollutant identification, *Aromatic compounds, *Organic compounds, Water quality control, *Organic matter, *Water analysis, Analytical techniques, Organic wastes, Waste treatment, Water quality, Analysis, Chemistry, Evaluation, Monitoring, Sewage treatment, *Potable water, Public health, Reclaimed water, Water utilization, Aquatic environment, Trace elements, Separation techniques, Domestic wastes.
Identifiers: *Polynuclear aromatic hydrocarbons, Carcinogen compounds, Fused ring compounds, Pyrolysis systems, Activated carbon filters.

A review was given of the analytical techniques available for monitoring polynuclear aromatic hydrocarbons (PAH) in raw, potable, and wastewaters. In addition, the effects of water and wastewater treatment processes upon levels of PAH were reviewed and consideration was given to the probable sources of such compounds in the aqueous environment. Analytical results have shown that PAH derived from drinking water contribute only a small proportion to the average total human intake. However, there are still many aspects of the occurrence, formation, and degradation of these compounds which need clarification. The reliability of much of the information concerning the removal of PAH by conventional water treatment processes is open to considerable doubt. Further analytical work is required in this field, and fundamental studies of the chemical changes that occur with chlorination of these compounds at low concentrations are necessary. Increasing water reuse makes the need for this type of information particularly acute. (Henley-ISWS)
W75-08453

AN EXAMINATION OF THE CONCENTRATION OF ORGANIC COMPONENTS WATER-EXTRACTED FROM PETROLEUM PRODUCTS,
Naval Research Lab., Washington, D.C.
P. J. Sniegoski.
Water Research, Vol 9, No 4, p 421-423, April 1975. 1 fig, 2 tab, 4 ref.

Descriptors: *Pollutant identification, *Oil wastes, *Oily water, Organic compounds, *Analytical techniques, *Organic wastes, Solvent extractions, Organic matter, Water pollution sources, Chemical wastes, Water pollution, Water quality, Oil, Fuels, Oil spills, Oil-water interfaces, Waste water(Pollution), Ships, Separation techniques.
Identifiers: *Dissolved organics, Total carbon analysis, Polar compounds.

Overboard discharge of effluent water resulting from the usual methods used to separate ships' oily waste water may present a pollution problem since the dissolved organics are present. By means of total carbon analysis the solubility characteristics of petroleum products commonly found in naval vessels were investigated. Special emphasis was given to the dependence of the organic concentration in the water phase to the water-oil ratio of the system. By means of various abstractive treatments an estimate was made of the relative amounts of polar compounds and hydrocarbons that are present in the water phase. (Henley-ISWS)
W75-08454

CONCENTRATION OF ADENOVIRUS FROM SEAWATER,
New Hampshire Univ., Durham. Dept. of Microbiology.
H. A. Fields, and T. G. Metcalf.

Water Research, Vol 9, No 4, p 357-364, April 1975. 8 tab, 15 ref. NSF Grant GI 38976.

Descriptors: *Viruses, *Sea water, *Aquatic microorganisms, *Analytical techniques, *Water pollution, Microorganisms, Biology, Water pollution sources, Oceans, Salinity, Membranes, Filters, Chemistry, Water quality, Analysis, Assay, Monitoring, Microbiology.
Identifiers: *Adenovirus, Virology, Aqueous polymer phase separation.

Factors influencing adenovirus 5 recovery from seawater by virus concentrator methods were determined. A 19,000-fold concentration of 25 gal samples with a theoretical recovery efficiency of 90% was possible with input multiplicities of 1000 TCID sub 50 units/ml. Pretreatment of orlon and cellulose acetate filters with beef extract or between 80 solutions promoted adenovirus passage during sample clarification. Adenovirus adsorbed to textile and epoxy fiberglass filters at acid pH. Adsorption to textile filters was enhanced by 0.05 M MgC12. No salt enhancement was necessary for adsorption to epoxy fiberglass filters. Adenovirus was recovered from adsorbent filters following elution with 3% beef extract solution adjusted to pH 9.0. Adenovirus was reconcentrated from beef extract eluates by aqueous polymer phase separation. Actual recovery of 106 PFU of adenovirus from 50 gal of a waste treatment plant effluent was made with the modified virus concentrator procedure developed in the study. (Henley-ISWS)
W75-08455

NITRIFICATION IN RIVERS IN THE TRENT BASIN,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W75-08456

A SIMPLE RESPIROMETER FOR MEASURING OXYGEN AND NITRATE CONSUMPTION IN BACTERIAL CULTURES,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
J. F. van Kessel.
Water Research, Vol 9, No 4, p 417-419, April 1975. 4 fig, 4 ref.

Descriptors: *Pollutant identification, *Denitrification, *Microorganisms, *Oxygen, *Nitrates, *Analytical techniques, Chemistry, Instrumentation, Respiration, Oxygen requirements, Dissolved oxygen, Nitrogen compounds, Nitrites, Nitrogen cycle, Chemical reactions, Pseudomonas, Cultures, Bacteria.
Identifiers: *Respirometer, Specific ion electrode, Polarographic sensor, Terminal electron acceptor.

A simple respirometer was described to measure simultaneously oxygen and nitrate concentrations. It proved to be an easy tool in denitrification studies. This was tested in Pseudomonas aeruginosa. (Henley-ISWS)
W75-08458

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
For primary bibliographic entry see Field 5B.
W75-08460

SPECTRAL STUDIES OF MONILIFORMIN AND AFLATOXIN B1,
Auburn Univ., Ala. Dept. of Chemistry.
J. A. Lansden.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 339, $4.25 in paper copy, $2.25 in microfiche. MS Thesis, December 1973. 49 p, 18 fig, 16 ref. OWRT A-035-ALA(3).

Descriptors: *Pollutants, Water quality, Bioassay, Fluorescence, *Pollutant identification, Volumetric analysis, *Spectrophotometry, Chemical analysis.
Identifiers:. Southern corn blight, Fungus metabolites, Fluorescence excitation, Emission spectra, Phosphorescence emission spectrum, *Moniliformin, *Aflatoxin B1.

The spectroanalytical parameters of moniliformin were investigated. The fluorescence and phosphorescence spectra were reported as well as the quantum efficiency of fluorescence and the phosphorescence lifetime. An hypothesis was expounded to explain anomalies occurring in the work. The interaction of desoxynuclaic acid (DNA) with moniliformin was investigated using fluorescence titration techniques. Moniliformin was found to interact with a linear dependency on the concentration of DNA. Interactions of bovine serum albumin and nucleic acid histone with moniliformin were not observed. The triplet-triplet absorption spectrum of aflatoxin B1 was reported using kinetic flash techniques. The T-T absorption bands in aflatoxin B1 were assigned. Investigation of triplet-triplet absorption spectra for moniliformin was also performed and negative results were reported.
W75-08475

THE PHOTOSENSITIZING ACTION OF 2-NAPHTHYLAMINE ON ESCHERICHIA COLI, K-12,
Auburn Univ., Ala. Dept. of Chemistry.
A. F. Osteen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 340, $4.25 in paper copy, $2.25 in microfiche. MS Thesis, November 1973. 45 p, 10 fig, 3 tab, 12 ref. OWRT A-035-ALA(2).

Descriptors: *Pollutants, Water quality, Assay, Industrial wastes, *Toxicity, Coliforms, *E. coli, Bacteria, *Pollutant identification, *Bioassay, Water pollution effects.
Identifiers: Carcinogens, *Phototoxicity, Photodynamic assay, *Amines.

2-naphthylamine is an industrial carcinogen which has been under study since 1930. Biological investigators have tested for tumor incidence caused by injections, oral doses, or vapor inhalation, of the amine and its metabolites. In this study the phototoxicity of the amine is investigated by conducting binding studies and measuring the energy transferred from the amine to Escherichia coli, a coliform bacteria. Detection of a photoproduct of the amine formed within timed periods of the kill zone has been accomplished and preliminary study of its spectra has been made.
W75-08476

ANALYSES OF SELECTED CONSTITUENTS IN NATIVE WATER AND SOIL IN THE BAYOU BOEUF-CHENE-BLACK AREA NEAR MORGAN CITY, LOUISIANA, INCLUDING A MODIFIED STANDARD ELUTRIATE TEST,
Geological Survey, Baton Rouge, La.
F. C. Wells, and A. J. Gogel.
Open-file report 75-176, April 1975. 23 p, 1 fig, 6 tab, 4 ref, 2 append.

Descriptors: *Water quality, *Dredging, *Bayous, *Louisiana, Data collections, Chemical analysis, Sampling, Soils, Core drilling, Sediments, Inland waterways, Evaluation, Water pollution effects.
Identifiers: *Chene Bayou(La), *Black Bayou(La), Dredging effects.

A series of analytical tests, including a modified standard elutriate test, were performed on native water, cores of shallow sediments, marsh soil, and core-water mixtures collected from nine sites along Bayous Chene and Black near Morgan City, La. The work was done at the request of the U.S. Army Corps of Engineers to provide data on possible influences that dredging might have on water quality in the area. Results of the analyses indicate that the native waters are well oxygenated, alkaline, and low in concentrations of dissolved solids. Concentrations of heavy metals in the native waters are low in the dissolved, suspended, and total phases; and concentrations of dissolved metals in the core-water mixture show little or no increase over dissolved metals in the native water. However, in the total phase, concentrations of metals in the core-water mixture are much greater than in the native water, due to the greater quantities of suspended matter, with adsorbed metals, in the mixture. Concentrations of volatile solids, nutrients, and chemical oxygen demand are low in the native waters. High concentrations of these constituents in the core material, marsh soil, and subsequently in the core-water mixture are probably due to the presence of large amounts of organic material. Concentrations of oil and grease and pesticides were low in all samples. (Woodard-USGS)
W75-08501

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7A.
W75-08519

MICROBIOLOGICAL STUDY OF THE INFLUENCE OF CHALK ON POND MUD, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
For primary bibliographic entry see Field 5B.
W75-08522

NON-FLAME ATOMIZATION IN ATOMIC ABSORPTION SPECTROMETRY,
Auckland Univ. (New Zealand). Dept. of Chemistry.
J. Aggett, and A. J. Sprott.
Analytica Chimica Acta, Vol 72, No 2, p 49-56, September, 1974. 6 tab, 13 ref.

Descriptors: *Spectroscopy, *Analytical techniques, Instrumentation, *Metals, Chemical analysis, Testing procedures, Oxices, Chemical reactions, *Pollutant identification, Cobalt, Tin, Iron, Nickel.
Identifiers: *Atomic absorption spectroscopy.

The role of the metal oxides and the graphite in non-flame atomizers was examined. Graphite probably acts as a reducing agent in the atomization of cobalt, iron, nickel and tin. Interferences may originate both on the surface of the graphite rod and in the vapor phase immediately above the rod. The origin of these interferences is discussed. A non-flame atomizer modified to use tantalum filaments was used in combination with a Unicam SP90A atomic absorption spectrophotometer in the experiments. (Pulliam-Vanderbilt)
W75-08529

STANDARDIZATION OF METHODS FOR THE DETERMINATION OF TRACES OF MERCURY -- PART I. DETERMINATION OF TOTAL INORGANIC MERCURY IN INORGANIC SAMPLES.
Bureau International Technique du Chlore, Brussels (Belgium). Mercury Analysis Working Party.
Analytica Chimica Acta, Vol 72, No 2, p 37-48, September, 1974. 3 fig, 3 tab, 14 ref.

Descriptors: *Spectroscopy, *Analytical techniques, *Mercury, *Inorganic compounds, Metals, Chemical analysis, Testing procedures, Instrumentation, Industrial plants, Trace elements, *Pollutant identification.
Identifiers: Sample preparation, Atomic absorption spectroscopy.

Flameless atomic absorption spectrometry was selected as the best method to determine mercury. To carry out the determination, all mercury compounds are converted into metallic mercury. A method is described for the determination of total inorganic mercury in inorganic samples. The method can be used for the routine determination of mercury in process streams and wastes of a chlor alkali electrolysis plant (excluding chlorine). In general, the procedure should be capable of detecting 0.01 microgram of Hg in a solution with a (maximum) volume of 40 ml. Results for interlaboratory trials involving up to 37 participating laboratories were presented. Samples with Hg contents between 20 micrograms/kg and 20 mg/kg were analyzed. Statistical evaluation of the results gave a value of 4-8% for repeatability and 6-22% for reproducibility. (Pulliam-Vanderbilt)
W75-08530

PB IN PARTICULATES FROM THE LOWER ATMOSPHERE OF THE EASTERN ATLANTIC,
Liverpool Univ. (England). Dept. of Oceanography.
R. Chester, and J. H. Stoner.
Nature, Vol 245, No 5419, p 27-28, September 7, 1973. 1 tab, 1 fig, 8 ref.

Descriptors: *Lead, *Air pollution effects, *Spatial distribution, *Atlantic Ocean, Sampling, On-site data collections, Industrial wastes, Water pollution, *Path of pollutants, *Pollutant identification.

Particulates were collected from seawater and from the lower atmosphere (approximately 15m above the sea surface) over large tracts of the world ocean. There was a marked decrease in the lead contents of the particulates southwards from the Westerlies to the Inter-Tropical Convergence Zone (ITCZ) in the northern hemisphere, and a decrease from the variable winds of the South African coast to the ITCZ in the southern hemisphere. This offers evidence of anthropogenic effects on the lead concentrations of particulates from oceanic regions. The effects were geographically dependent, the highest lead concentrations being found in particulates originating from relatively heavily populated source areas such as Western Europe, which can supply solids to the Westerlies in this region of the North Atlantic, and South Africa. (Jernigan-Vanderbilt)
W75-08531

SOME OBSERVATIONS ON THE DETERMINATION OF COPPER WITH THIOCYANATE,
Loughborough Univ. of Technology (England). Dept. of Chemistry.
W. P. Hayes, A. H. Sasa, V. S. Fareed, and D. T. Burns.
Analytica Chimica Acta, Vol 71, No 1, p 210-214, July, 1974. 20 ref.

Descriptors: *Copper, *Chemical precipitation, *Potentiometers, *Volumetric analysis, Analytical techniques, Iron, Testing procedures, Gravimetric analysis, Oxidation, Reduction(Chemical), *Pollutant identification, Chemical analysis.
Identifiers: Thiocyanates.

The relative merits of various reducing agents in gravimetric procedures, the interferences caused by diverse ions, and the conditions under which thiocyanate acts as reductant were investigated. Also described are studies of the titration of copper in the presence of thiocyanate. Determination of copper in solution by reduction from copper (II) to copper (I) and precipitating as copper (I) thiocyanate was achieved by using a variety of reducing agents. The titration of copper (II) by the ascorbic acid procedure was preferred to the hydroquinone procedure. In the potentiometric titrations the potential change with ascorbic acid was much greater than found with hydroquinone, making the endpoint determination simpler and more precise. No suitable visual in-

dicator was found to use with hydroquinone but 2,6-dichlorophenol was satisfactory with ascorbic acid. (Jernigan-Vanderbilt)
W75-08532

THE DISTRIBUTION OF IN-TRAPERITONEALLY INJECTED CADMIUM-115M IN CHICKENS,
Purdue Univ., Lafayette Ind. Dept. of Bionucleonics.
R. D. Dyer, G. S. Born, and W. V. Kessler.
Environmental Letters, Vol 7, No 2, p 119-124, June, 1974, 1 tab, 20 ref. (5-TO1-RL00064-09) USPHS (5 TO1-ES00071-05).

Descriptors: *Cadmium, *Radioisotopes, *Poultry, *Distribution, Tracers, Toxicity, Inorganic compounds, Laboratory tests, Testing procedures, Absorption, Trace elements, *Pollutant identification.

Cadmium was injected into Leghorn chickens in trace quantities over a 12-week period. Six chickens were given weekly for 12 weeks intraperitoneal injections containing trace quantities of cadmium acetate labeled with Cd-115m. After the 12-week injection period, the chickens were maintained for 3 additional weeks. During this time they began laying eggs which were collected. The chickens were sacrificed and the cadmium levels in various tissues were determined. The liver and kidneys showed the largest percentages of whole body cadmium. Small percentages were found in eggs. (Jernigan-Vanderbilt)
W75-08533

DETERMINATION OF NANOGRAM QUANTITIES OF MERCURY IN SEA WATER,
Marine Research Inst., Reykjavik (Iceland).
J. Olafsson.
Analytica Chimica Acta, Vol 68, No 1, p 207-211, January, 1974. 2 fig, 1 tab, 17 ref.

Descriptors: *Mercury, *Sea water, *Analytical techniques, *Spectroscopy, Gold, Sampling, Inorganic compounds, Tin, Testing procedures, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy.

A flameless atomic absorption procedure coupled to amlgamation on gold for the determination of nanogram quantities of mercury in samples from North Atlantic waters was described. Early results showed that after inorganic mercury salts in deionized water had been reduced with tin (II) chloride, the mercury vapor could be collected from a stream of argon by amalgamation with gold. Moreover, the mercury could be completely released from the gold by heating and then carried with a stream of argon into the optical cell for measurement. However, when this procedure was applied to sea water spiked with mercury, low and irreproducible recoveries were found. This was remedied by greatly reducing the argon flow rate and simultaneously increasing the time of aeration. At fast argon flow rates, droplets of sea water were carried over to the mercury collector, and their chloride content greatly reduces the extent of amalgamation. (Jernigan-Vanderbilt)
W75-08535

SPECTROPHOTOMETRIC DETERMINATION OF TUNGSTEN IN ROCKS BY AN ISOTOPE DILUTION PROCEDURE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2K.
W75-08536

THE ELECTRODEPOSITION AND DETERMINATION OF RADIUM BY ISOTOPIC DILUTION IN SEA WATER AND IN SEDIMENTS SIMULTANEOUSLY WITH OTHER NATURAL RADIONUCLIDES,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.

M. Koide, and K. W. Bruland.
Analytica Chimica Acta, Vol 75, No 1, p 1-19, March, 1975. 7 fig, 3 tab, 34 ref.

Descriptors: *Radium radioisotopes, *Sea water, *Sediments, *Water analysis, Analytical techniques, Radioisotopes, Uranium radioisotopes, Tracers, Water pollution sources, Trace elements, Lead, Isotope studies, Lead radioisotopes, Background radiation, *Radiochemical analysis, Aluminum, Phosphates, Nitrates, Radiation, *Pollutant identification.

An isotopic dilution method has been developed for the determination of Ra226 and Ra228 in sea water and sediments with Ra223 as a yield tracer. An alternative procedure which obviates the need for Ra223 is demonstrated for sediments by the assay of Ra224 and Th228 which occur naturally in sediments. In addition, a direct method for beta-counting Ra228-Ac228 is proposed. Radium, polonium, thorium, and uranium isotopes and Pb210 are co-precipitated from sea water with aluminum phosphate carrier. The radium and Pb210 are co-precipitated with lead nitrate in sediment leachings. All radium procedures utilize identical chemical isolation and the cathodic electrodeposition of radium. Subsequently, the alpha-radiation emitted by Ra226, Ra223, and Ra224 is determined by pulse-height analysis; the Ra228-Ac228 and Pb210-Bi210 are measured by low background anticoincidence beta-counting techniques. The Ra226 method is applicable to all environmental samples, whereas Ra228 determinations are limited to applications where the Ra228/Ra226 activity ratio is greater than 0.1. This method is especially attractive for studies of parent-daughter disequilibria. (Witt-IPC)
W75-08538

DETERMINATION OF SELENIUM IN WATER AND INDUSTRIAL EFFLUENTS BY FLAMELESS ATOMIC ABSORPTION,
Calgon Corp., Pittsburgh, Pa.
E. L. Henn.
Analytical Chemistry, Vol 47, No 3, p 428-432, March, 1975. 4 fig, 3 tab, 12 ref.

Descriptors: *Water analysis, *Industrial wastes, *Spectrophotometry, *Pollutant identification, Analytical techniques, Water pollution sources, Chemical analysis, Cation exchange, Metals, Cations, Ions, Trace elements, Chemicals, Colorimetry, Molybdenum, Inorganic compounds, Resins.
Identifiers: *Selenium.

A procedure for determining selenium in water and industrial effluents is described. The method utilizes flameless atomic absorption preceded by treatment with a cation exchange resin to eliminate interference from metallic cations and the addition of molybdenum to enhance sensitivity and suppress interference from inorganic anions. Advantages and limitations of the method are discussed, and analytical results on real samples are compared with those obtained using the colorimetric diaminobenzidine method. The range of the test is 1.0 to 50 microgram/liter selenium. (Witt-IPC)
W75-08541

ARTIFICIAL FOG PRODUCED BY INDUSTRIAL EMISSION OF WATER VAPOR (BROUILLARDS ARTIFICIELS PRODUITS PAR EMISSION INDUSTRIELLE DE VAPEUR D'EAU),
Quebec Univ., Chicoutimi. Centre de Recherche du Moyen Nord.
L. P. Cong, and J. Dessens.
Journal de Recherches Atmospheriques, Vol 7, No 2, p 109-116, April/June, 1973. 4 fig, 1 tab, 4 ref.

Descriptors: *Fog, *Water vapor, *Industrial wastes, *Air pollution effects, *Pulp and paper industry, Gases, Atmosphere, Condensation, Solar

radiation, Chemical analysis, Foreign countries, Europe, Climates, Pollutants, Air pollution, Air environment, Pollution abatement.

Water vapor is not considered an atmospheric pollutant and is usually ignored in studies related to air pollution. However, under particular conditions, water vapor emitted by industrial plants can give rise to stable artificial fog and thus influence the local climate. This is the case for the Saint-Gaudens (Haute-Garonne) mill of La Cellulose d'Aquitaine, located a short distance from the river in an enclosed valley characterized by the absence of wind and by frequent inversions. Recently a significant increase in fog frequency was observed, coinciding with a production increase at the mill. The higher frequency as well as persistence of the fog until the noon hours prompted a study of the origin and nature of the emission. Studied were the visibility, the spectrum of droplets, and the chemical composition of the fog. The results of these studies established the contribution of the mill to the formation of fog. Due to nocturnal inversion, the water vapor emitted from the mill can form a fog that can cover tens of sq km, the solar radiation maintaining the inversion conditions by heating the upper layer of the fog. The high water content of the fog and its small droplets account for the low visibility. The fog could be controlled either by condensing the water vapor at its source or by a treatment which would increase the size of the droplets and accelerate the dissipation of the fog. (Stapinski-IPC)
W75-08545

PRECONCENTRATION AND X-RAY FLUORESCENCE DETERMINATION OF COPPER, NICKEL, AND ZINC IN SEA WATER,
Georgia Univ., Athens. Dept. of Zoology.
D. E. Leyden, T. A. Patterson, and J. J. Alberts.
Analytical Chemistry, Vol 47, No 4, p 733-735, April, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Copper, *Nickel, *Zinc, *Sea water, *Water analysis, *X-ray fluorescence, Ion exchange, Trace elements, Water pollution sources, Metals, Water pollution, Analytical techniques, Resins, Separation techniques, Chemical analysis, *Pollutant identification.
Identifiers: Tetraethylenepentamine, Toluene diisocyanate.

Copper, nickel, and zinc in 500 ml sea water samples were concentrated on an ion-exchange resin prepared from tetraethylenepentamine and toluene diisocyanate. The resin containing the Cu, Ni, and Zn was then compressed into a pellet which was used for the x-ray fluorescence determination. The recovery of Cu, Ni, and Zn from sea water at pH 8.2 when their concentrations ranged from 2 to 24 micrograms/liter was 92, 97, 93%, respectively. (Witt-IPC)
W75-08549

PRELIMINARY RESULTS ON THE USE OF TENAX UOR THE EXTRACTION OF PESTICIDES AND POLYNUCLEAR AROMATIC HYDROCARBONS FROM SURFACE AND DRINKING WATERS FOR ANALYTICAL PPRPOSES,
Rome Univ. (Italy). Istituto d'Igiene.
V. Leoni, G. Puccetti, and A. Grella.
Journal of Chromatography, Vol 106, No 1, p 119-124, March 19, 1975. 3 tab, 15 ref.

Descriptors: *Pesticides, *Water analysis, *Pollutant identification, Analytical techniques, Potable water, Surface waters, Trace elements, Water pollution sources, Wastes, Pollutants, Separation techniques, Chromatography, Gas chromatography, Organophosphorus pesticides, Organic pesticides, Chlorinated hydrocarbon pesticides, Water pollution, Surfactants, Oil, Lipids, Organic compounds.
Identifiers: *Tenax, Thin-layer chromatography, Acetone, Dibutyl ether.

Organic pollutants such as pesticides and polynuclear aromatic hydrocarbons are extracted from water by passing the latter through a column packed with Tenax. Tenax is a porous polymer based on 2,6-diphenyl-p-phenylene oxide made by ENKA (Amsterdam). The pesticides are eluted from the Tenax with dibutyl ether and analyzed by gas chromatography. The hydrocarbons are removed from the column with acetone followed by thin-layer chromatography and analysis by spectrophotofluorimetry. In the absence of other contaminants and under conditions standardized as optimal, the recovery of these substances is, on the average, over 90% both for the organochlorine and organophosphorus pesticides and for polynuclear aromatic hydrocarbons. Research into the effectiveness of extraction with Tenax from natural waters and water artificially contaminated with surfactants, fats and oils, etc., is now being carried out. (Witt-IPC)
W75-08550

SPECTROPHOTOMETRIC DETERMINATION OF DISSOLVED OXYGEN CONCENTRATION IN WATER,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
W. S. Duval, P. J. Brockington, M. S. von Melville, and G. H. Geen.
Journal of the Fisheries Research Board of Canada, Vol 31, No 9, p 1529-1530, September 1974. 2 fig, 4 ref.

Descriptors: *Dissolved oxygen, *Colorimetry, *Water analysis, Analytical techniques, *Spectrophotometry, Iodine, *Pollutant identification.
Identifiers: Winkler method.

A modification of the Winkler method which increases precision while decreasing the time required for dissolved oxygen analysis is described. The technique involves colorimetric determination of liberated iodine at 287.5 nm. (Witt-IPC)
W75-08551

SINGLE-SWEEP POLAROGRAPHIC TECHNIQUES USEFUL IN MICROPOLLUTION STUDIES OF GROUND AND SURFACE WATERS,
Naval Weapons Center, China Lake, Calif.
G. C. Whitnack.
Analytical Chemistry, Vol 47, No 4, p 618-621, April 1975. 10 fig, 1 tab, 15 ref.

Descriptors: *Pollutant identification, *Water analysis, *Polarographic analysis, *Groundwater, *Surface waters, Rivers, Wells, Springs, Potable water, Sea water, Waste water(Pollution), Chromium, Arsenic compounds, Iodine, Lead, Cadmium, Manganese, Copper, Nickel, Zinc, Ions, Explosives, Nitrogen compounds, Water pollution sources, Analytical techniques, Pollutant identification, Pollutants, Water pollution, Chemical analysis.
Identifiers: Uranium, Selenium, Tellurium, Thallium, Plasticizers, Nitroglycerine, 1-2-propylene glycol dinitrate, 2,4,6-trinitrotoluene, TNT, 1-3-5-trinitro-1-3-5-hexahydrotriazine, Diethyl phthalate, Dibutyl sebacate.

Single-sweep polarographic procedures have been developed that have proved useful to detecting and analyzing a number of micropollutants in river water, well and spring water, tap water, sea water, and waste waters from many sources. Potential methods of analysis are discussed for soluble ionic species such as Cr(III) and Cr(VI), As(III) and As(V), iodines and iodates. Some uranium, selenium, lead, cadmium, tellurium, thallium, manganese, copper, nickel, and zinc ionic species were also studied, and techniques are presented for their analysis. Techniques for the single-sweep polarographic analysis of traces of explosives and plasticizers in water, such as nitroglycerine, 1,2-

propylene glycol dinitrate, 2,4,6-trinitrotoluene (TNT), 1,3,5-trinitro-1,3,5-hexahydrotriazine, diethyl phthalate, and dibutyl sebacate are also presented and discussed. (Witt-IPC)
W75-08554

ORGANIC SUBSTANCES IN POTABLE WATER AND IN ITS PRECURSOR. III. THE CLOSED-LOOP STRIPPING PROCEDURE COMPARED WITH RAPID LIQUID EXTRACTION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Gas Chromatography Lab.
K. Grob, K. Grob, Jr., and G. Grob.
Journal of Chromatography, Vol 106, No 2, p 299-315, March 26, 1975. 6 fig, 4 tab, 18 ref.

Descriptors: *Organic compounds, *Gas chromatography, *Water analysis, Analytical techniques, Chemical analysis, Chromatography, Potable water, Separation techniques, Water pollution sources, Organic wastes, Trace elements, Water chemistry, Water properties, Water pollution, Pollutants, Water types, *Pollutant identification.

An attempt is made to define the role of gas chromatography in the investigation of organic substances in water, which is important because the handling of water samples before gas chromatographic analysis depends entirely on the information expected from the subsequent separation, identification, and quantification. Practical long-term experience with the previously published closed-loop stripping procedure (with intermediate adsorption on activated carbon) is described, and further refinements are reported. A rapid and simple liquid extraction method is described, based on shaking 1 liter of water with a small volume (0.5-1 ml) of solvent and subsequent high-resolution gas chromatographic analysis of the extract. Qualitative and semiquantitative information at the parts per trillion level is easily obtained. Further studies of recovery rates under conditions where the volatility and polarity of extracted organic substances are varied are described for both methods. The suitability of both methods for the analysis of different types of water samples is discussed. The final decision in favor of one or other method probably depends in most instances on two fundamental conditions: (1) availability of the equipment for stripping; (2) the relative importance of the volatility range for light and medium versus heavy pollutants. (Witt-IPC)
W75-08556

THE USE OF MEMBRANE ELECTRODES IN THE DETERMINATION OF SULPHIDES IN SEA WATER,
E. Mor, V. Scotto, G. Marcenaro, and G. Alabiso.
Analytica Chimica Acta, Vol 75, No 1, p 159-167, March 1975. 5 fig, 1 tab, 14 ref.

Descriptors: *Sulfides, *Sea water, *Water analysis, Thermodynamics, Water pollution sources, Pollutants, Analytical techniques, *Electrodes, Potentiometers, Hydrogen ion concentration, Membranes, Inorganic compounds, Sulfur compounds.
Identifiers: *Membrane electrodes(Sulfide-selective).

The direct potentiometric determination of sulfides in natural sea water with a sulfide-selective membrane electrode is proposed. The experimental evaluation of the apparent mixed dissociation constants and the thermodynamic activity coefficient in spiked sea water samples, by means of the electrode, permits direct calibration in terms of activity. Alternatively, it is possible to establish, for natural sea water, an experimental equation for the correction of the electrode potentials in terms of pH; this allows direct calibration of the electrodes in terms of total sulfide concentration. This criterion can be applied to any aqueous solution. (Witt-IPC)
W75-08558

DETERMINATION OF NITRATE IN WATER WITH AN AMMONIA PROBE,
Brussels Univ. (Belgium). Laboratorium Analytische Chemie.
J. Mertens, Winkel P. Van den, and D. L. Massart.
Analytical Chemistry, Vol 47, No 3, p 522-526, March 1975. 6 fig, 6 tab, 24 ref.

Descriptors: *Nitrates, *Water analysis, Ammonia, Reduction(Chemical), Analytical techniques, Chemical analysis, Water pollution sources, Water, Water chemistry, Water properties, Trace elements, Inorganic compounds, Nitrogen compounds, Nitrites, Chemicals, Water quality, *Pollutant identification.
Identifiers: *Ammonia probe, Devarda alloy.

Manual and automatic procedures are described for the determination of nitrates in water containing ammonia by means of an ammonia probe. The nitrates are determined by measuring the ammonia produced during a heterogeneous reduction by means of Devarda alloy powder. The yield of the nitrate reduction with the Devarda alloy was quantitative. The method shows good accuracy and reproducibility and can be applied in waters ranging from mineral water to sewage. Procedures for the elimination of excess ammonium and nitrite are proposed. Other reduction methods, which did not yield good results, are also discussed. (Witt-IPC)
W75-08561

FLOW-THROUGH APPARATUS FOR ACUTE TOXICITY BIOASSAYS WITH AQUATIC INVERTEBRATES,
Fisheries and Marine Service, Winnipeg (Manitoba). Aquatic Toxic Studies Div.
H. D. Maciorowski, and P. M. Kondra.
Canadian Department of the Environment, Fisheries and Marine Service, Technical Report No. CEN/T-75-2, 1975. 20 p, 1 fig, 4 tab, 5 ref.

Descriptors: *Aquatic life, *Bioassay, Equipment, *Toxicity, Water pollution effects, Water quality, Invertebrates.
Identifiers: *Mount-Brungs diluter.

A description is given of a modified Mount-Brungs proportional diluter used as an acute toxicity bioassay system for aquatic invertebrates. Differences between the original and modified models are outlined, and construction problems associated with modifying the Mount-Brungs diluter are discussed. (Witt-IPC)
W75-08563

DETECTION OF GB, VX AND PARATHION IN WATER,
Edgewood Arsenal, Aberdeen Proving Ground, Md.
R. M. Gamson, D. W. Robinson, and A. Goodman.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 079, $3.25 in paper copy, $2.25 in microfiche. Technical Report ED-TR-74015, June, 1974. 18 p, 1 tab, 2 fig, 10 ref.

Descriptors: *Monitoring *Pesticides, Technology, *Organophosphorus compounds, *Enzymes, *Inhibitors, Water pollution, *Pollutant identification, Toxicants.
Identifiers: *Parathion, Agent GB, Agent VX, *Cholinesterase.

A simple device containing paper impregnated with cholinesterase is reported for detection of organophosphorus agents in the ppb to ppm range in water. Parathion is included for comparison. Optimum performance is obtained at 20C and pH 8. Under these conditions, the enzyme is completely inhibited in 20 minutes or less by 10 ppb up to 1 ppm depending on the inhibitor. Comparison of inhibition data with rate constants indicates that the sensitivity of the device to any given inhibitor can be estimated if the rate constant value is known

for that inhibitor with horse serum cholinesterase. (Katz)
W75-08582

APPARATUS AND PROCEDURE FOR MEASURING SUBLETHAL TOXICITY OF WASTE-WATER DISCHARGES,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
R. A. Callahan.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-787 456, $6.25 in paper copy, $2.25 in microfiche. Air Force Weapons Laboratory (DEE), Kirtland Air Force Base, New Mexico Report AFWL-TR-74-55, July 1974. 94 p, 16 fig, 14 tab, 56 ref, 4 append.

Descriptors: *Toxicity, Waste water(Pollution), Waste water disposal, *Monitoring, Control systems, *Respiration, *Bioassay, *Design, Measurement, *Pollutant identification, Equipment, Animal physiology, Fish, Trout, Rainbow trout, Brook trout, Computer programs.
Identifiers: Sublethal toxicity, Salvelinus fontinalis.

A screening test to detect the presence of sublethal toxicity was developed. Changes in respiration rates were used as the criteria for toxicity to aquatic life in wastewater effluents. An aquatic respirometry system and a data acquisition system were designed, constructed, and tested. Respiration rates are determined by electronically measuring the current used by a demand-type electrolysis cell which generates oxygen by the electrolysis of water. The oxygen concentrations within the respirometers vary less than plus or minus 0.05 mg/l; measurements of oxygen consumption exceed 98 per cent accuracy. The respirometers are connected to a toxicant metering system which automatically dispenses up to 13 different concentrations of toxicants. Normal operation consists of three cycles: toxicant renewal, equilibration, and data acquisition, all performed automatically. A holding facility producing large numbers of animals suitable for bioassay testing was also designed and constructed. Data are presented showing the growth rates of rainbow trout (Salmo gairdneri) and brook trout (Salvelinus fontinalis) in this holding facility. The routine respiration rates of these species measured in the respirometry system are compared with rates reported in the literature. Preliminary experiments determined the effects of ammonia and two fire fighting foams on trout respiration. A computer program was written which tests the data for interaction between time and treatment effects, graphs the data according to several formats, and performs various tests for significance. (Katz)
W75-08586

METHODS FOR ACUTE TOXICITY TESTS WITH FISH, MACROINVERTEBRATES, AND AMPHIBIANS.
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W75-08591

THE OCCURRENCE OF BENTHOS DEEP IN THE SUBSTRATUM OF A STREAM,
Waterloo Univ. (Ontario). Dept. of Biology.
D. D. Williams, and H. B. N. Hynes.
Freshwater Biol. Vol 4, No 3, p 233-256. 1974, Illus.

Descriptors: *Benthos, *Benthic fauna, Canada, *Rivers, *Streams, *Sampling, *Analytical techniques, *Connate water, Chemical analysis, Biomass, *Samplers.
Identifiers: Chironomide Hyporheos, Ontario, Parameters, Sampler, Stream, Substratum, Temperature, Hyporheal, Hyporheic, *Interstitial sampling methods, *Speed River(Ont).

The vertical distribution of the benthic fauna of the Speed River, Ontario was studied over a 13-mo. period from Oct. 1970-Oct. 1971. Various physical and chemical parameters of this interstitial environment were also measured. Several new techniques for sampling the interstitial environment of rivers were devised. These methods and their relative efficiencies are considered. The validity of the terms 'hyporheal' and 'hyporheic' are discussed and the term 'hyporheos' is offered to replace the former. A brief resume of interstitial sampling methods is given with comments on their limitations for sampling deep heterogeneous substrates. Chemical parameters are more important in the control and distribution of the fauna than physical parameters. Many larvae of stream-dwelling chironomids have overwintering stages when they penetrate deep into the substrate to: actively feed on the trapped organic detritus; and follow an optimum temperature for development. The shape of an organisms probably determines its success as a hyporheic form. The numbers of animals occurring in the sub-benthic populations are very large. For the Speed River, estimates of between 184, 760 and 797,960 animals/m3 are made for different times of the year. Dry weight biomass is estimated to vary between 30.9 and 253-2 g/m3 throughout the year. Sub-benthic or hyporheic populations exist in at least 3 other Canadian rivers. Some of the animals found are common to 2 or more of these rivers. The inefficiencies of many conventional benthic samplers is sampling the total biomass of certain streams with hyporheic populations is discussed.--Copyright 1974, Biological Abstracts, Inc.
W75-08602

SEASONAL VARIATION OF SIEVING EFFICIENCY IN LOTIC HABITAT,
Commonwealth Scientific and Industrial Research Organization, Deception Bay (Australia). Div. of Fisheries and Oceanography.
W. E. Barber, and N. R. Kevern.
Freshwater Biol, Vol 4, No 3, p 293-300, Illus, 1974.

Descriptors: *Diptera, Biomass, *Lotic environment, Aquatic environment, *Insects, *Aquatic insects, *Sieve analysis, *Seasonal sieves, Mayflies.
Identifiers: Chironomid, Coleoptera, Mite, Plecoptera, Simuliid, Trichoptera.

Sieving efficiency, defined as the percent increase in yield of numbers or biomass of organisms, obtained by use of a sieve with 0.25-mm mesh openings instead of a 0.50-mm meshed sieve, was investigated in a lotic habitat over a 12 mo. period. Greatest efficiencies obtained were 300-600% for mayflies, chironomids, simuliids, 'other dipterans,' water mites and plecopterans and 90 and 190% for trichopterans and coleopterans, respectively. For the fauna as a whole, efficiency varied from 95-325% over the study period. Efficiency in estimating biomass was not as great as that with numbers and generally was below 10% for trichopterans, mayflies, 'other dipterans,' coleopterans and the fauna taken as a whole. For chironomids, simuliids and water mites efficiencies generally were higher than 10% and reached as high as 174%, 60% and 80%, respectively. In all groups efficiency varies throughout the year with lowest occurring during winter months. The findings are compared with data found in the literature and discussed in relation to structural, behavioral, and life history characters.--Copyright 1974, Biological Abstracts, Inc.
W75-08609

WATER TURBIDITY MEASURING APPARATUS,
Fishmaster Products, Inc., Tulsa, Okla. (assignee)
For primary bibliographic entry see Field 7B.
W75-08626

REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION AND REGENERATION OF SULFUR CONTAINING ADDITIVES,
Argonne National Lab., Ill.
G. J. Vogel, W. M. Swift, J. F. Lenc, P. T. Cunningham, and W. I. Wilson.
Available from the National Technical Information Service, Springfield, Va 22161 as Rept. No ANL/ES-CEN-1007, and EPA-650/2-74-104, $5.45 in paper copy, $2.25 in microfiche. Annual Report, July 1973-June 1974. ANL/ES-CEN-1007 and EPA-650/2-74-104, (1974). 135 p, 31 fig, 25 tab, 26 ref.

Descriptors: *Burning, *Chemical reactions, *Coals, *Effluents, *Trace elements, Environment, Soil chemical properties, Water chemistry, Water properties, Kinetics, Transfer, Movement, Sulfur compounds, Mercury, Lead, Beryllium, Fluorine.
Identifiers: *Combustion, *Fluidized-bed.

The program for developing and demonstrating the feasibility of fluidized-bed combustion for possible use in power and steam-plant applications is divided into three studies: (a) the combustion of coal in a pressurized combustor; (b) a determination of the distribution of trace elements in the combustion products; and (c) a fundamental investigation of the kinetics of additive sulfation and regeneration reactions. A bench-scale, fluidized-bed combustion pilot plant capable of operating at 10-atm pressure was used to evaluate the effects of operating variables on response variables such as SO2 and NO levels in the flue gas, combustion efficiency, additive utilization, and heat-transfer coefficients. High retentions of sulfur (>90%) and low NO levels (<150 ppm) were achieved. The combustor was also successfully tested using a variety of coals: a highly caking, high-volatile bituminous coal, a high ash subbituminous coal, and a low-heating-value lignite. (Houser-ORNL)
W75-08642

DISPERSION AND MOVEMENT OF TRITIUM IN A SHALLOW AQUIFER IN MORTANDAD CANYON AT THE LOS ALAMOS SCIENTIFIC LABORATORY,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W75-08645

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE COOPER NUCLEAR STATION AUGUST 1972.
EG and G, Inc., Las Vegas, Nev.
Available from the National Technical Information Service, Springfield, Va 22161 as ARMS-72.6.5., $4.00 in paper copy, $2.25 in microfiche. Report No ARMS-72.6.5, August 1974. 22 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Surveys, *Monitoring, *Measurement, *Radioactivity, *Remote sensing, *Aerial sensing, Aircraft, Data collections, Nuclear powerplants, Effluents, Sites, Fallout, Public health, Background radiation.
Identifiers: *Cooper Nuclear Station, Gamma radiation.

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Cooper Nuclear Station during August 1972, prior to reactor start-up. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of 700 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. (Houser-ORNL)
W75-08648

GEOLOGY OF GEOTHERMAL TEST HOLE
GT-2, FENTON HILL SITE, JULY 1974,
Los Alamos Scientific Lab., N. Mex.
W. D. Purtymun, F. G. West, and R. A. Pettitt.
Available from the National Technical Informa-
tion Service, Springfield, Va 22161 as LA-5780-
MS, $4.00 in paper copy, $2.25 in microfiche. Rept
No LA-5780-MS, November 1974. 15 p, 3 fig, 5
tab, 13 ref.

Descriptors: *Geology, *Testing, *Test wells,
*Geothermal studies, *Borehole geophysics, Tem-
perature, *Thermal properties, Hydrologic data,
Well logging.

The test hole GT-2, drilled at the Fenton Hill Site,
was completed at a depth of 6346 ft (1934.3 m)
below land surface. The hole penetrated 450 ft
(137.2 m) of Cenozoic volcanics, 1945 ft (592.8 m)
of sediments of Permian and Pennsylvanian age
and 3951 ft (1204.3 m) of granitic rocks of Precam-
brian age. The field geologic log of the hole and
hydrologic data compiled during the drilling phase
of the program are presented. (Houser-ORNL)
W75-08649

TRITIUM AND NOBLE GAS FISSION
PRODUCTS IN THE NUCLEAR FUEL CYCLE.
I. REACTORS,
Argonne National Lab., Ill.
L. E. Trevorrow, B. J. Kullen, R. L. Jarry, and M.
J. Steindler.
Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
ANL-8102, $5.45 in paper copy, $2.25 in
microfiche. Rept No ANL-8102, October 1974. 88
p, 24 fig, 25 tab, 130 ref, append.

Descriptors: *Nuclear reactors, *Effluents,
*Tritium, *Fuels, Behavior, Toxins, *Path of pol-
lutants, Gases, Liquids.
Identifiers: *Noble gas, *Fuel cycle, Fission
products.

A review of the behavior of tritium and noble-gas
fission products in nuclear reactors is presented.
The sources of tritium considered include fission
and activation of poisons and impurities in coo-
lants. The noble gases included in this review are
limited to fission products, with emphasis on the
long-lived species. Reactor types surveyed include
light water reactors, high-temperature gas-cooled
reactors, and liquid-metal-cooled fast breeder
reactors. Data indicative of the normal operating
procedures have been expanded to provide esti-
mates of the quantities of tritium and noble gases
and their diluents expected at various points along
the flow path for both gaseous and liquid waste
streams. Data are normalized to an energy of 1000
MWe-yr to permit comparison with present-
generation reactors. (Houser-ORNL)
W75-08652

LIQUID PLUGGING IN IN-SITU COAL GASIFI-
CATION PROCESSES,
California Univ., Livermore. Lawrence Liver-
more Lab.
D. W. Gregg.
Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
UCRL-51686, $4.00 in paper copy, $2.25 in
microfiche. Rept No UCRL-51686, October 1974.
9 p, 1 fig, 7 ref.

Descriptors: *Coals, *Burning, *Chemical reac-
tions, *Oxidation, *Research and development,
Fossil fuels, Liquids, Condensation, Gases, Flow,
Air demand, Flow system, Kinetics, Hydraulic
design, Hydraulics.
Identifiers: *Coal gasification, Energy research.

The presence of liquids can severely alter the spa-
cial propagation characteristics of the flame front
in an in-situ coal gasification process. In a cocur-
rent burn, the liquids, water, and coal tars will be
baked or pyrolyzed out of the coal in the hot zone

near the flame front and will condense on cooler
coal further downstream from the flame front. In
the region where condensation is taking place, the
liquids can plug the formation and thus alter or
stop the gas flow pattern necessary for maintain-
ing a spacially controlled flame front. Liquid
plugging effects and their relationship to the
permeability and the absolute crack sizes in the
formation are discussed in a semiquantitative
manner. The calculations presented are a rough
guide to the requirements for preparing the coal
seam with hydraulic or explosive fracturing, when
such fracturing is needed. (Houser-ORNL)
W75-08657

A NEW IN-SITU COAL GASIFICATION
PROCESS THAT COMPENSATES FOR FLAME-
FRONT CHANNELING, RESULTING IN 100%
RESOURCE UTILIZATION,
California Univ., Livermore. Lawrence Liver-
more Lab.
D. W. Gregg.
Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
UCRL-51676, $4.00 in paper copy, $2.25 in
microfiche. Rept No UCRL-51676, October 1974.
8 p, 2 fig, 9 ref.

Descriptors: *Coals, *Burning, *Oxidation,
*Liquids, Theoretical analysis, Evaluation, Gases,
Flow, Gravity flow, Boreholes, Mining engineer-
ing.
Identifiers: *Coal gasification, Energy develop-
ment.

Flame-front channeling and liquid plugging are im-
portant, if not the dominant, mechanisms that will
limit the fractional resource recovery for many
proposed concepts for in-situ gasification of coal.
A method is described to gasify coal in situ, using
gravitational forces and a specified drill hole pat-
tern, to compensate for flame-front channeling
along both the vertical and horizontal axes
(elevation and plan views). The theoretical
resource utilization for this method of coal gasifi-
cation is 100%. (Houser-ORNL)
W75-08658

PROJECT DIAMOND ORE, PHASE IIA:
CLOSE-IN MEASUREMENTS PROGRAM,
California Univ., Livermore. Lawrence Liver-
more Lab.
C. J. Sisemore, D. E. Burton, and J. B. Bryan.
Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
UCRL-51620, $5.45 in paper copy, $2.25 in
microfiche. Rept No UCRL-51620, August 1974.
61 p, 12 fig, 6 tab, 7 ref.

Descriptors: *Nuclear explosions, *Beneficial
use, *Craters, *Rock mechanics,
*Instrumentation, *Measurement, Seismology,
Seismographs, Seismic waves, Vibrations, Sound
waves, Stress, Velocity, *Montana.
Identifiers: Project Diamond Ore(Mont).

Project Diamond Ore was designed to determine
the effects of temming, depth of burial, and
geology on nuclear and high explosive cratering
phenomena. Phase IIA included three multition
chemical explosive cratering events. The close-in
instrumentation for these events provided data to
further code development work and to determine
detonation histories. The instrumentation plan and
emplacement procedures are described, and the
recorded waveforms are reported, summarized,
and interpreted in detail. (Houser-ORNL)
W75-08659

FURTHER NUMERICAL MODEL STUDIES OF
THE WASHOUT OF HYGROSCOPIC PARTI-
CLES IN THE ATMOSPHERE,
California Univ., Livermore. Lawrence Liver-
more Lab.
G. J. Stensland.

Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
UCRL-51614, $4.00 in paper copy, $2.25 in
microfiche. Rept No UCRL-51614, July 2, 1974. 24
p, 13 fig, 2 tab, 18 ref.

Descriptors: *Washouts, *Fallout, *Hygroscopic
water, *Sediment load, Suspended load, Particle
size, Raindrops, Rain, Rainfall, Rain water,
Evaporation, Model studies.

Numerical and analytical methods are used to
study rainout and washout of hygroscopic parti-
cles in the atmosphere. The variation in concentra-
tion of hygroscopic material in rain water was in-
vestigated as a function of raindrop size class,
changing radius of released particles due to drop
evaporation, and time from initiation of rainfall.
(Houser-ORNL)
W75-08660

A DIRECT SOLUTION OF THE SPHERICAL-
HARMONICS APPROXIMATION TO THE
TRANSFER EQUATION FOR A PLANE-PARAL-
LEL, NONHOMOGENEOUS ATMOSPHERE,
California Univ., Livermore. Lawrence Liver-
more Lab.
J. V. Dave.
Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
UCRL-51581, $4.00 in paper copy, $2.25 in
microfiche. Rept No UCRL-51581, June 17, 1974.
54 p, 1 append.

Descriptors: *Radioactivity, *Radiation,
*Transfer, *Model studies, Atmosphere, Air en-
vironment, Diffusion, Gases, Aerosols, Clouds,
Meteoric water, Mathematical studies.

In recent years, the method of obtaining a direct
solution of the spherical harmonics approximation
to the equation of radiative transfer has been
shown to be a very efficient and powerful one for
the evaluation of diffuse fluxes at various levels of
a plane-parallel, nonhomogeneous atmosphere
containing arbitrary height distributions of absorb-
ing gases, aerosol particles, and cloud water drops.
Presented are (a) a detailed derivation of the
spherical harmonics equations starting with the
basic transfer equation, and (B) a description of
the method for the numerical solution of the
resultant system of linear equations. To be con-
sistent with the other published work in this field,
the zenith angle is measured relative to the nega-
tive normal-optical-thickness axis. Furthermore,
to provide a full treatment of the planetary radia-
tion problem, earlier derivations have been ex-
tended to include isotropic illumination of the at-
mosphere from below. (Houser-ORNL)
W75-08661

NUCLEAR CHEMICAL COPPER MINING AND
REFINING: RADIOLOGICAL CONSIDERA-
TIONS,
California Univ., Livermore. Lawrence Liver-
more Lab.
For primary bibliographic entry see Field 5C.
W75-08662

ENVIRONMENTAL RADIOACTIVITY IN THE
FAROES IN 1973,
Danish Atomic Energy Commission, Risoe.
Research Establishment.
A. Aarkrog, and J. Lippert.
Available from the National Technical Informa-
tion Service, Springfield, Va. 22161, as Rept No
Riso 306, $4.00 in paper copy, $2.25 in microfiche.
Report No Riso 306, July 1974. 21 p, 9 fig, 17 tab, 5
ref.

Descriptors: *Environment, *Monitoring,
*Measurement, *Radioactivity, *Fallout, Cesium,
Strontium, Sampling, Precipitation(Atmospheric),
Grasses, Milk, Fish, Sea Water, Food chains,
Vegetable crops, Potatoes, Biology, Domestic
water, Diets.

Identifiers: *Faroes.

Measurements of fall-out radioactivity in the Faroes in 1973 are presented. Sr 90 (and Cs 137 in most instances) was determined in regularly collected samples of precipitation, grass, milk, fish, sea water, bread, and drinking water. In addition, analyses of spot samples of lamb, potatoes, sea plants, vegetables, eggs, and human bone were carried out. Estimates of the mean contents of Sr 90 and Cs 137 in the human diet in the Faroes in 1973 are given. (Houser-ORNL)
W75-08663

ENVIRONMENTAL RADIOACTIVITY IN GREENLAND IN 1973,
Danish Atomic Energy Commission, Risoe. Research Establishment.
A. Aarkrog, and J. Lippert.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No Riso-307, $4.00 in paper copy, $2.25 in microfiche. Report No Riso 307, July 1974. 20 p, 7 fig, 11 tab, 4 ref.

Descriptors: *Environment, *Monitoring, *Measurement, *Radioactivity, *Fallout, Cesium, Strontium, Precipitation(Atmospheric), Sea water, Vegetation, Domestic water, Aquatic animals, Diets, Human pathology.
Identifiers: *Greenland.

Measurements of fall-out radioactivity in Greenland in 1973 are reported. Strontium-90 (and Caesium-137 in most instances) was determined in samples of precipitation, sea water, vegetation, animals, and drinking water. Estimates of the mean contents of Sr 90 and Cs 137 in the human diet in Greenland in 1973 are given. (Houser-ORNL)
W75-08664

NATURAL RADIATION EXPOSURE IN THE UNITED STATES,
Office of Radiation Programs, Washington, D.C.
D. T. Oakley.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No PB-235 795, $4.75 in paper copy, $2.25 in microfiche. June 1972. 68 p, 17 fig, 23 tab, 134 ref.

Descriptors: *Environment, *Radioactivity, *Background radiation, Population, Human population, Geology, Elevation, Assessment, Surveys, Measurement.
Identifiers: *Dosimetry, Natural radiation, *Population exposure, *Cosmic radiation.

The exposure of man to natural radiation sources in the United States has been estimated by considering the distribution of the population with respect to certain factors, principally geology and elevation, which influence exposure to terrestrial and cosmic radiation. Data obtained by aerial surveys in the United states have been used to calculate an average dose equivalent (DE) estimate of 40 mrem/yr. to the population. The results also indicate three distinct areas of terrestrial radioactivity in the United States - (1) the Coastal Plain, which consists of all or portions of States from Texas to New Jersey (23 mrem/yr.); (2) a portion of the Colorado Front Range (90 mrem/yr.); and (3) the rest of the United States not included in '1' or '2' (46 mrem/yr.). Since elevation is the primary determinant of cosmic ray DE in the United States, the population distribution with respect to elevation was determined. The average population elevation in the United States was determined to be approximately 700 feet, and the average cosmic ray DE was estimated to be 44 mrem/yr. To arrive at an estimate of the gonadal DE, the influence of housing, biological shielding, and DE contribution of internal emitters was also considered. The first two factors serve to attenuate man's gonadal DE due to terrestrial radiation by about the same amount that is contributed by internal emitters.

The average gonadal DE to the U.S. Population was calculated to be 86 mrem/yr. (Houser-ORNL)
W75-08669

STORMWATER POLLUTION--SAMPLING AND MEASUREMENT,
Trent Polytechnic, Nottingham (England). Dept. of Building and Civil Engineering.
C. G. J. Tucker.
Journal of the Institution of Municipal Engineers, Vol 101, No 10, p 269-273, October, 1974. 6 fig, 1 tab, 10 ref.

Descriptors: *Urban runoff, *Storm water, *Measurement, *Storm runoff, Flow, Automation, *Pollutant identification, *Sampling, Hydrographs, Installation, Manholes, Dilution, Water pollution sources, *Path of pollutants, Control.
Identifiers: Dilution gauging, Gulp injection, Lithium tracer.

Assessment of the nature of urban runoff pollutants requires the measurement of both flow and composition throughout a storm. It is important that automatic equipment measure the initial flow, where a first flush of pollutant often occurs. Various types of automatic control may be used, such as floats, static head transducers and pressure switches. Sampling may be done on a continuous or discrete basis at variable time intervals. Two methods of dilution gauging, constant rate injection and gulp injection, are used for measuring storm water. A lithium tracer is used since rainfall and runoff do not contain natural lithium. Described is the method of gulp injection, controlled by an interval sampler which is activated by an automatic float switch. A mass of tracer solution is added to the flow in a gulp dose. The passage of the resultant pulse is measured downstream. Equipment is detailed; its installation in manholes is simple, so long as space is sufficient for sampler and doser to pass through a 21-inch manhole ring. Results are given by storm hydrographs and concentration-time curves which are plotted to determine the polluting constituents. The integrated or Total Storm Load (TSL) value is found. This TSL is derived from a sum of the sampling intervals and represents the quantity of a pollutant which is washed by a storm from the surface water catchment. (Prague-FIRL)
W75-08678

QUANTITATIVE DETERMINATION OF FREON 12 AND FREON 22 IN WATER, (IN RUSSIAN),
N. A. Petrova, and G. S. Salyamon.
Gig Sanit. Vol 38, No 10, 68-71, Illus, 1973.

Descriptors: *Analytical techniques, *Colorimetry, *Oxygen, *Pollutant identification.
Identifiers: Alkali, *Freon, Pyridine, Organohalogen compounds, USSR.

The colorimetric reaction of organohalogen compounds with pyridine and alkali is suitable for analyzing Freon 22 in water. The determinable minimum is 2 microgram of Freon 22 in the sample (or 0.2 mg/l). However, the reaction is not recommended for analyzing Freon 12 in water, since accompanying impurities have a strong effect on the color. To analyze Freon 12 in water, a method was developed which is based on blowing it out of the water with a stream of O_2 and igniting it in a quartz tube over a Pt screen with subsequent colorimetry of the F ion. The range of analysis is 4-280 mg/l.--Copyright 1975, Biological Abstracts, Inc.
W75-08682

RESPONSES OF THE THREE TEST ALGAE OF THE ALGAL ASSAY PROCEDURE: BOTTLE TEST,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
A. G. Payne.
Water Research, Vol 9, No 4, p 437-445, April 1975. 13 fig, 7 ref, 3 append.

Descriptors: *Algae, *Bioassay, *Nutrients, *Sewage, *Analytical techniques, Phytoplankton, Microorganisms, Assay, Testing, Water analysis, Water chemistry, Water quality, Sewage treatment, Nutrient requirements, Productivity, Water properties, Growth rates, *Pollutant identification.
Identifiers: Selenastrum capricornutum, Microcystis aeruginosa, Anabaena flos-aquae.

The Algal Assay Procedure (AAP): Bottle Test utilizes three test organisms which, under standardized culture conditions, give a range of responses to the physical and nutritional states of test waters. The test algae of the AAP are Selenastrum capricornutum, Microcystis aeruginosa, and Anabaena flos-aquae. The responses of these organisms to light intensities and to micro- and macronutrients were described. Phosphate spikes as low as 1-2 micrograms P/l were shown to give a measurable bioassay response in highly oligotrophic waters. The AAP test algae were used to assess the effects of nutrient enrichment with sewage in waters from a cross section of U.S. lakes. Enrichment of oligotrophic waters with primary or secondary sewage effluent results in significant growth of the three algae, while sewage additions to eutrophic waters cause little or no significant increase in algal growth rate or maximum standing crop. The response of the AAP algae also indicate the nutrient removal by tertiary treatment greatly reduces the stimulatory properties of sewage. In the presence of tertiary sewage, growth rate and maximum standing crop of the three test organisms are near those of lake water controls. The AAP test protocol was shown to be useful in the determination of limiting nutrients and in the comparison of the algal growth potential of natural waters to that of defined media. (Henley-ISWS)
W75-08710

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURE,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 7B.
W75-08760

THE RADIOACTIVE, METALLIC AND BACTERIAL POLLUTANTS IN THE ESTUARY OF THE ESCAUT (SCHELT) RIVER AND ON THE COAST OF BELGIUM, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
E. Peeters, and M. Mertens.
Bull Inst R Sci Nat Belg Biol. Vol 49, No 12, 1-10. Illus. 1973.

Descriptors: Rivers, *Europe, *Pollutants, *Estuaries, Water pollution sources, *Sampling, Analysis, Analytical techniques, Uranium, Radiochemical analysis, Bacteria, Radioactive wastes, Spectrophotometry, *Pollutant identification.
Identifiers: Bacteria pollution, *Belgium, Escaut River, Metallic pollution, Radioactive pollution, Schelde, Spectrophotometry, Schelt River, Spectro-photometric methods.

The Institute of Natural Sciences (Belgium) conducted a study of the different kinds of pollution, using the newest techniques of sampling, treatment and protection of samples for analysis in the laboratory. Activities in microCi/kg for radioactive Cs137, Ce144, and Bi214/T1208 were recorded and charted from samplings at several different stations at high and low tides and in sediments. Gamma-spectrophotometry of suspended material retained on filters are reported. Clay sediments have the highest radioactive Cs content. Samples from the Schelt estuary show a Bi214/T1208 ratio in excess of 1, indicating U contamination from the river itself.--Copyright 1975, Biological Abstracts, Inc.
W75-08774

QUALITY OF PUBLIC WATER SUPPLIES OF NEW YORK, MAY 1972-MAY 1973.
Geological Survey, Albany, N.Y.
Open-file report, 1975. 8 fig, 2 tab, 11 ref.

Descriptors: *Water quality, *Chemical analysis, *Water supply, *New York, Sampling, *Data collections, Sites, Inorganic compounds, Nutrients, Coliforms, Trace elements, Hydrologic data, Pollutant identification.

This report is the second in a series that presents analytical results of water samples collected in a continuing study of the quality of public water supplies in the State of New York. From May 16, 1972, to May 3, 1973, samples were collected from 233 public water supply and 13 industrial systems. The general locations of the systems are shown on maps. A total of 739 samples were collected: 498 raw-water samples, 52 treated-water samples, and 189 distribution-system samples. Paired raw and treated or distribution samples were collected from 17 systems. Thirty-two sites were selected for repetitive sampling. Raw water samples were collected from 16 systems at about 2-week intervals. Raw and treated samples were collected from 13 systems and from three New York City distribution sampling sites at about 3-month intervals. Analyses are arranged in three columns. Major constituents, selected physical properties, and minor constituents determined in the Albany laboratory are in the first column. Minor constituents determined by spectrographic analysis in the Denver laboratory and total coliform bacteria colony counts made in the field by USGS personnel are in the second column. Pesticide and related constituents determined in the Washington laboratory are in the third column. (Woodard-USGS)
W75-08832

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 2. WATER QUALITY RECORDS.
Geological Survey, Lincoln, Nebr.
Data Report, 1975. 212 p, 1 fig, 4 tab, 25 ref.

Descriptors: *Pollutant identification, *Water quality, *Chemical analysis, *Nebraska, Surface waters, Groundwater, Physical properties, Sediment transport, Particle size, Inorganic compounds, Biological properties, Water temperature, Sampling, Sites, *Data collections, Hydrologic data, Well data.

Water-resources data for the 1973 water year for Nebraska include records of data for the chemical and physical characteristics of surface and groundwater. Data on the quality of surface water (chemical, biological, temperature, and sediment) were collected from 64 sampling sites. Chemical quality data are reported for 57 of these sites; water temperature for 16; and sediment analyses for 10 of the sites. Records of chemical analyses and well data are given for about 700 groundwater sites. Records for pertinent water-quality stations in border States are included. (Woodard-USGS)
W75-08833

STREAM RECONNAISSANCE FOR NUTRIENTS AND OTHER WATER-QUALITY PARAMETERS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Carnegie, Pa.
R. M. Beall.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 493, $3.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 50-74, February 1975. 47 p, 7 fig, 2 plate, 4 tab, 30 ref.

Descriptors: *Pollutant identification, *Water quality, *Streams, *Regional analysis, *Nutrients, *Pennsylvania, Chemical analysis, Data collections, Chemical properties, Inorganic compounds, Water pollution sources, Sampling.

Eighty-five stream sites in and near the six-county Greater Pittsburgh Region were sampled in mid-June 1971 and again in mid-October 1972. Data are reported for 89 sites (including 4 substitute sites sampled in the second period). Drainage areas of the basins sampled ranged from 4.1 to 19,500 square miles (10.6 to 50,500 square kilometers). The chemical analyses include constituents of three general classes: (1) nutrients, (2) activity indicators, and (3) dominant anions. Nutrient concentrations were high enough to indicate potential problems at about a quarter of the sampling sites. Temperature, dissolved oxygen, and pH values indicated a generally favorable capacity for regeneration or recovery from degradation, although a number of streams east of the Allegheny and Monongahela Rivers are marginal or lacking in that capacity. Regionally, sulfate is the dominant ion and was observed in concentrations of 40 milligrams per litre or more at 90% of the sites. Bicarbonate exceeded 100 milligrams per litre at 22 sites. A moderate to high degree of mineralization, as indicated by conductance readings of more than 500 micromhos per centimeter at half of the sampling sites, is a characteristic of the region's surface waters. (Woodard-USGS)
W75-08835

EVALUATION OF METHODS FOR ESTIMATING STREAM WATER QUALITY PARAMETERS IN A TRANSIENT MODEL FROM STOCHASTIC DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W75-08849

5B. Sources Of Pollution

EFFECTS OF URBANIZATION ON WATER QUALITY,
Water Resources Engineers, Inc., Springfield, Va. and DeKalb County Planning Dept., Decatur, Ga.
R. P. Shubinski, and S. N. Nelson.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 297, $3.75 in paper copy, $2.25 in microfiche. American Society of Civil Engineers, Urban Water Resources Research Program Technical Memorandum No 26, New York, NY, March, 1975, 34 p, 11 tab, 7 fig, 29 ref. OWRT C-5045(No 4224)(2), OWRT 14-31-0001-4224.

Descriptors: *Comprehensive planning, *Urbanization, *Water pollution sources, *Land use, *Environmental effects, *Impaired water quality, Pollutants, Erosion, Hydrologic aspects, Drainage effects, Aquatic environment, Project planning, *City planning.
Identifiers: *Metropolitan studies, *Receiving waters, Storm sewer discharges, Combined sewer overflows, Stormwater treatment.

The intended audience for this Technical Memorandum is urban planners. Numerical values are given whenever available. Land use and water quality relationships are outlined, including the relations between source and type of water pollution. Effects of land use on point discharges are enumerated, for residential, commercial, industrial and power generation land uses. A parallel evaluation is made of nonpoint discharges from urban storm runoff, agricultural drainage, construction runoff and resource extraction. Also, effects of land use are categorized within environmentally sensitive areas, such as flood-plains and shorelines, aquifer recharge areas and estuaries and wetlands. (McPherson-ASCE)
W75-08351

THE CONTRIBUTION OF AGRICULTURE TO EUTROPHICATION OF SWISS WATERS: I. RESULTS OF DIRECT MEASUREMENTS IN

THE DRAINAGE AREA OF VARIOUS MAIN DRAINAGE CHANNELS,
Eidgenoessische Technische Hochschule, Kastienbaum (Switzerland). Hydrobiology Lab.
R. Gaechter, and O. J. Furrer.
Schweiz Z Hydrol, Vol 34, No 1, p 41-70, 1972. Illus.

Descriptors: Europe, *Eutrophication, Agriculture, *Drainage area, Erosion, Algae, Nitrogen, Nutrients, *Lakes, Phosphorous, Essential nutrients, Nitrogen compounds, Phosphorus compounds, *Aquatic algae, *Drains, *Channels, *Measurement.
Identifiers: Alpine, *Switzerland.

In Swiss lakes, the growth of algae is generally limited by the supply of P but sometimes also by that of N. This nutrient supply into waters originates from the atmosphere (rainfall, fixation and N), from the soils in the drainage area (leaching and erosion) and from wastewater. The P and N loss in soil dependent on the method of cultivation, climatic conditions and topography was assessed. The increased loss of P in the Lower Alpine regions used for agricultural purposes accounts for the greater amount of specific run-off (m3/km2. year) and for the steep positions favoring erosion. It is assumed that the higher rate of N in soils of the lowland regions where the climate is milder, is caused on the one hand by the more intensive microbiological mobilization and on the other by the more frequent application of nitrogenous fertilizers. The agricultural contribution to the total nutrient load of a lake depends on the cultivation method in the drainage area, as well as on the population density and the effectiveness of wastewater purification. As a rule, it is assumed that for conditions prevailing in Switzerland, more than 70% of N, but less than 50% of P discharged into the lakes, originate from the soil of drainage areas. In the case of balanced growth, N and P are assimilated by algae in a weight ratio of about 7:1. The N/P ratio in receiving water bodies of the Lower Alpine region, not influenced by wastewater, amounts to about 30, in the lowland region to about 80 and would only decrease to about 7 when mixed with untreated sewage ($N/P = 4 : 1$) from a population of 200-300 inhabitants/km2. From those 2 macro-elements one can infer that in most cases there is a nitrogen surplus, while the P supply is the growth limiting element in algae. A tolerable supply of P from the drainage area dependent on the mean depth of a lake and the surrounding factor fU (fU = drainage area/lake surface) is given. The danger exists that in many cases this critical value is attained or even exceeded through P depletion in soil alone.--Copyright 1974, Biological Abstracts, Inc.
W75-08376

MODELLING PRIMARY PRODUCTIN IN WATER BODIES: A NUMERICAL APPROACH THAT ALLOWS VERTICAL INHOMOGENEITIES,
Fisheries Research Board of Canada, Winnipeg, (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W75-08379

RELATIONSHIP OF VARIOUS INDICES OF WATER QUALITY TO DENITRIFICATION IN SURFACE WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W75-08384

EGGSHELL THINNING, CHLORINATED HYDROCARBONS, AND MERCURY IN INLAND AQUATIC BIRD EGGS, 1969 AND 1970,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
For primary bibliographic entry see Field 5C.
W75-08391

LIQUID BRINE IN ICE SHELVES,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W75-08407

THE FORMATION OF BRINE DRAINAGE FEATURES IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W75-08408

A STOCHASTIC MODEL OF DISPERSION IN A POROUS MEDIUM,
Ecole Polytechnique, Montreal (Quebec).
For primary bibliographic entry see Field 2F.
W75-08435

POLYNUCLEAR AROMATIC HYDROCARBONS IN RAW, POTABLE AND WASTE WATER,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 5A.
W75-08453

NITRIFICATION IN RIVERS IN THE TRENT BASIN,
Water Pollution Research Lab., Stevenage (England).
E. J. C. Curtis, K. Durrant, and M. M. I. Harman.
Water Research, Vol 9, No 3, p 255-268, March 1975. 4 fig, 13 tab, 15 ref.

Descriptors: *Nitrification, *Rivers, *Microbial degradation, Microorganisms, Aquatic microorganisms, Bacteria, Nitrites, Nitrates, Oxidation, Biochemical oxygen demand, Water pollution, Biochemistry, Sediments.
Identifiers: *River Trent basin, River Tame.

The presence of autotrophic nitrifying bacteria in the waters and sediments of both the River Trent and its polluted tributary the River Tame was established and their concentrations determined. Nitrification was shown to occur mainly in the sediments, where it was estimated that at least 80% of the oxidation of ammonia occurred. (Sims-ISWS)
W75-08456

THE EFFECT OF WEATHERING ON A CRUDE OIL RESIDUE EXPOSED AT SEA,
University Coll. of North Wales, Bangor. Dept. of Marine Biology.
S. J. Davis, and C. F. Gibbs.
Water Research, Vol 9, No 3, p 275-285, March 1975. 7 fig, 3 tab, 25 ref.

Descriptors: *Oil wastes, *Weathering, *Sea water, Emulsions, Oil spills, Biodegradation, Degradation(Decomposition), Chemical degradation, Chemical analysis, Chromatography, Chemical properties, Physical properties, Viscosity, Oil, Oily water, Water pollution.

Kuwait crude oil residues have been exposed to weathering at sea (Langstone Harbour, Portsmouth) for 2 yr, in the form of a water-in-oil emulsion ('chocolate mousse') in a floating layer about 1.4 cm thick. One batch of oil was exposed in a tank open to tidal flushing below the water line, and a second batch was exposed in a closed tank. A number of chemical and physical properties of the oil were measured at intervals, as were the concentrations of mineral nutrients and bacterial numbers in the sea water. Asphaltenes, specific gravity, and viscosity all increased, as did the 'polar' fraction from liquid chromatography. The n-alkanes decreased to about half the original levels in the open tank but were little altered in the closed tank. The constancy of vanadium and nickel concentrations suggest that no net loss of oil

occurred, the substantial changes in properties deriving from chemical modification (probably oxidation and polymerization) of oil components, rather than mineralization (conversion to carbon dioxide and water) of some componenets leaving a residue of altered composition. It was not determined which of several processes predominated in causing these changes, but it is thought likely that in this thick layer of mousse auto-oxidation predominated over biodegradation. (Sims-ISWS)
W75-08457

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
R. N. Clark, A. D. Schneider, and B. A. Stewart.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 2, p 319-322. March-April 1975. 6 fig. 7 ref.

Descriptors: *Feed lots, *Surface runoff, *Water quality, *Agricultural runoff, Farm wastes, Great Plains, Runoff, Confinement pens, Cattle, *Texas, Path of pollutants, Pollutant identification.
Identifiers: *Feedlot runoff.

Runoff amounts and chemical quality were measured from a Southern Great Plains cattle feedlot at Bushland, Texas. The rainfall-runoff relationship for runoff-producing storms was linear, with about one-third of the rainfall in excess of 10 mm ending up as runoff. Runoff amounts were smaller but concentrations of various runoff constituents were higher than those found for cattle feedlots elsewhere. Low rainfall, high evaporation rates, and high stocking rates cause the manure pack in the feedlots to contain more salts, thus allowing increased concentrations in runoff. A dilution factor of about five parts well water to one part feedlot runoff would reduce the salinity hazard for irrigation from very high to medium for most holding ponds in the Southern Great Plains. Runoff caught in playas where the area of the feedlot is one-fifth or less of the total watershed could be considered as having a low or medium salinity hazard. (Jess-ISWS)
W75-08460

ENVIRONMENTAL EFFECTS OF DREDGING AND SPOIL DISPOSAL,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5C.
W75-08465

PHOSPHORUS SOURCES FOR LOWER GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Green Bay. Ecosystems Analysis.
P. E. Sager, and J. H. Wiersma.
Journal of Water Pollution Control Federation, Vol 47, No 3, p 504-514, March 1975. 3 fig, 2 tab, 18 ref.

Descriptors: *Water pollution sources, *Phosphorus, *Lake Michigan, Effluents, Eutrophication, Nutrients, Phosphates, Phosphorus compounds, Wastewater(Pollution), Water quality, Path of pollutants, Farm wastes, Algae, Water pollution, Sewage treatment, Runoff, Wisconsin.
Identifiers: *Green Bay(Wis), *Fox River(Wis), Orthophosphate.

The major sources of phosphorus for lower Green Bay were quantified and the significance of nonpoint sources in the lower Fox River drainage basin were determined. Sources examined included municipal waste treatment plants, surface runoff from rural and urban areas, industrial discharges, and Lake Winnebago. The relative importance of the major sources (rural runoff, Lake Winnebago, municipal treatment plants) varies considerably on a seasonal basis. Nonpoint sources (rural runoff and Lake Winnebago), in the

absence of controls, were expected to maintain high levels of phosphorus in Green Bay, despite control measures being implemented for municipal treatment plants in the drainage basin. (Sims-ISWS)
W75-08467

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT-PHASE II,
Washington Cooperative Fishery Unit, Seattle.
R. R. Whitney, and T. E. Wright.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 432, $3.75 in paper copy, $2.25 in microfiche. Annual Report, Quinault Resources Development Project, Quinault Tribal Council, Taholak, Washington, (April 30, 1975). 38 p, 16 fig, 2 tab. OWRT C-5336(no 4223)(2).

Descriptors: *Acid streams, *Salmonids, *Water pollution sources, Clear-cutting, Reforestation, Organic acids, Decomposing organic matter, Aquatic insects, Aquatic productivity, Drainage effects, Soil chemistry, Path of pollutants, Acidic soils, Lysimeter, Wood wastes, *Washington, Land use, Forest management, Environment.
Identifiers: *Gel permeation chromatography, *Cedar leachates, Quinault Indian Reservation(Wash), High water tables.

An investigation of stream quality as related to land use variables was undertaken on the Quinault Reservation. Low pH conditions and cedar leachates have been shown to play a part in low salmonid productivity. Investigations indicate that iron and other heavy metals in the soil matrix play important roles in stream pH levels. Lower pH resulting from the release of iron oxides has also been associated with chemical reactions occurring during groundwater movement through areas with different redox potentials. Laboratory analyses indicate that tropolones are the principal toxic substances in Western Red Cedar. Lethal effects of tropolones as related to temperature, iron concentration, acclimatization time, and pH were investigated in laboratory experiments using fish stocks of different genetic composition. No differences were found between genetic stocks or pH variations. Temperature, iron concentrations, and acclimatization times were significant factors in tropoline toxicity. No lethal levels of tropolones were found in study area streams. (See also W74-12355).
W75-08468

HEAT AND MOISTURE CONDUCTION IN UNSATURATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
J. A. Havens, and R. E. Babcock.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 328, $5.25 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayettevills, Publication No 25, May 1975. 108 p, 21 fig, 4 tab, 77 ref, 2 append. OWRT A-014-ARK(2), 74-31-0001-3804.

Descriptors: *Thermal pollution, *Heat transfer, Moisture, *Mathematical models, Soils, Soil moisture, Conduction, Forecasting, Pipes, Soil temperature, Soil profiles, Cooling water.
Identifiers: Waste heat, *Soil warming, *Moisture transfer, Underground pipes.

Mathematical models are developed for the prediction of heat transfer from hot water pipes buried in the soil. Heat transfer in the absence of moisture transfer is described as a function of the difference between the temperatre of the pipe and the temperature of the soil surface. The energy balance is used to determine the longitudinal temperature distribution of the water. The method is extended to describe a system of equally spaced, parallel buried pipes. Soil temperature profiles

around the pipes are presented. The model is used to calculate the land area that can be heated by an underground piping system carrying cooling water from the condensers of a 1000 MW nuclear-electric plant. A new development of the phenomenological equations for coupled heat and moisture flow, based on the theory of irreversible thermodynamics, is presented. Solutions of the equations for boundary conditions representative of buried piping systems designed for simultaneous soil heating and irrigation are presented.
W75-08477

DISTRIBUTION, CULTIVATION AND CHEMICAL DESTRUCTION OF GALLIONELLA FROM ALABAMA GROUND WATER,
Alabama Univ., University. Dept. of Microbiology.
R. D. Christian, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 341, $6.25 in paper copy, $2.25 in microfiche. M S Thesis, 1975. 145 p, 25 tab, 15 fig, 62 ref, 2 append. OWRT B-045-ALA(1). 1431-0001-3855.

Descriptors: *Iron bacteria, *Groundwater, *Microbiology, *Hydrogeology, *Alabama, Water wells, Disinfection, Water treatment, Ammonium compounds, Water pollution sources.
Identifiers: *Gallionella.

Results of hydrogeologic and microbiologic studies were combined to determine the ecology of the iron bacteria, Gallionella, in water systems in Alabama and to find a 'chemical cure' for water wells contaminated with this organism. Treatment of laboratory strains of Gallionella with disinfectants indicated that a chemical cure is possible; however, only field experiments can determine if permanent cures occur. Success in the future will probably depend on the effectiveness of quaternary ammonium compounds which have several advantages over chlorine compounds.
W75-08479

WATER AND SOLUTE TRANSPORT IN LAKE-LAND FINE SAND,
Florida Univ., Gainesville. Dept. of Soil Sciences.
A. A. Elzeftaway.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 342, $5.25 in paper copy, $2.25 in microfiche. PH D Thesis, 1974. 104 p, 18 fig, 5 tab, 78 ref, append. OWRT A-026-FLA(1). 14-31-0001-5009.

Descriptors: *Infiltration, *Herbicides, Fertilizers, Soils, *Sands, *2-4-D, *Chlorides, Solutes, Soil water, *Path of pollutants, Adsorption, Soil analysis.
Identifiers: Lakeland fine sand.

The objective was to investigate effects of three water supply rates--2,4 and 8 cm/hr--and three initial soil water contents--1,2, 10.9, and 20.2% by volume--upon the simultaneous transport of water and solutes--2,4-D herbicide and chloride--in vertical columns of Lakeland fine sand. Columns were prepared by packing air-dry soil into cylinders 7.6 cm diameter and 107 cm long. A specific volume of aqueous solution containing 57.9 ppm chloride and 5 ppm 2,4-D was introduced and displaced through each column. Gamma-ray attenuation and pressure-transducer-tensiometers were used to precisely monitor soil-water content and pressure distributions with time. Soil solution was extracted at selected depth intervals along the soil columns and extracted samples were then analyzed for 2,4-D and chloride content. Depths to which chloride and 2,4-D moved for a given quantity of water infiltrated into the surface of the soil was found to depend upon the surface water flux. Increasing water application rates resulted in an increased water content in surface soil and in shallower displacement of chloride and 2,4-D for equal quantities of accumulative infiltration. For a given quantity of water infiltrated, initial soil-water content

did not influence depths of chloride or 2,4-D transport. Adsorption caused 2,4-D distributions to lag behind those for chloride for all experiments. (Morgan-Florida)
W75-08480

ANALYSIS AND DESIGN OF SETTLING BASINS FOR IRRIGATION RETURN FLOW,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W75-08484

NON-EQUALIBRIUM THERMODYNAMIC TREATMENT OF TRANSPORT PROCESSES IN GROUND-WATER FLOW,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W75-08488

EMPIRICAL DATA ON LONGITUDINAL DISPERSION IN RIVERS,
Geological Survey, Denver, Colo.
C. F. Nordin, Jr., and G. V. Sabol.
Available from NTIS, Springfield, Va 22161 as PB-240 740, $7.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 20-74, August 1974. 332 p, 58 fig, 5 tab, 35 ref, 2 append.

Descriptors: *Dispersion, *Streams, *Mixing, Data collections, Hydrologic data, Diffusion, Path of pollutants.

Empirical data on longitudinal dispersion processes in rivers are compiled from published and unpublished sources. Fifty-one sets of data, covering flows from about 30 cubic feet per second to 241,000 cubic feet per second are analyzed graphically. For a few cases, the empirical data agree very well with the one-dimensional Fickian-type diffusion theory, but for many of the data, the dispersion processes exhibit a non-Fickian behavior with the properties that the variance of the concentration distribution of a conservative dispersant increases with time. The one-dimensional Fickian-type diffusion equation does not adequately describe longitudinal dispersion processes in some rivers. (Knapp-USGS)
W75-08495

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, SEGMENT 4A,
Geological Survey, Little Rock, Ark.
J. E. Terry, B. F. Lambert, E. E. Morris, and A. H. Ludwig.
Open-file report, 1975. 72 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Water quality standards.
Identifiers: *White River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 4A of the White River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment includes a 101-mile reach of the White River and selected reaches of its principal and minor tributaries. Dischargers in the segment consist of 8 municipalities and 5 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl),

and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentration of dissolved oxygen, total dissolved solids, chlorides, and sulfates in the White River meet standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08500

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, SEGMENT 4D,
Geological Survey, Little Rock, Ark.
J. E. Reed, J. E. Terry, M. E. Broom, and J. W. Stephens.
Open-file report, 1975. 55 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Water quality standards.
Identifiers: *White River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 4D of the White River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists chiefly of a 78-mile reach of the White River, a 38-mile reach of the Cypress Bayou, a 58-mile reach of Bayou Des Arc, and a 48-mile reach of Wattensaw Bayou. Dischargers in the segment consist of six municipalities. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentration of dissolved oxygen, total dissolved solids, chlorides, and sulfates in the White River, Segment 4D, meet standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08502

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SEGMENT 2E,
Geological Survey, Little Rock, Ark.
J. E. Terry, E. E. Morris, and J. W. Stephens.
Open-file report, 1975. 24 p, 2 fig, 4 tab, 5 ref, append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Water quality standards.
Identifiers: *Ouachita River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 2E of the Ouachita River water-quality management planning basin. Data for Segment 2E were not sufficient to apply the water-quality model. Instead, a method for determining target loads (maximum-waste load a stream can assimilate before dissolved oxygen is depleted below standards) was

used for all tributaries. The segment consists chiefly of a 69-mile reach of Cornie Creek and a 65-mile reach of Bayou de Loutre, and the principal tributaries along the reaches of these two streams. Dischargers in the segment consist of 2 municipalities and 6 industries. Waste-load conditions, present and 5-year projected, for each discharger in the segment are given. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) from each discharger on the streams in Segment 2E are summarized. (Knapp-USGS)
W75-08504

CHEMISTRY OF SUBSURFACE WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-08506

GROUND-WATER CONDITIONS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08509

CHEMICAL QUALITY OF GROUND WATER IN THE WESTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
L. J. Crain.
New Uork Department of Environmental Conservation, Albany, Basin Planning Report ORB-3, 1975. 69 p, 17 fig, 4 tab, 21 ref.

Descriptors: *Water quality, *Groundwater, *New York Water chemistry, Sampling, Hydrologic data, Data collections, Hydrogeology.
Identifiers: *Oswego River basin(NY), Finger Lakes(NY).

The Western Oswego River basin is an area of about 2,600 square miles in central New York. Within the boundaries of the area is all the drainage into (1) the four largest Finger Lakes (Cayuga, Seneca, Keuka, and Canandaigua) and (2) part of the New York State Barge Canal. The geology of the basin generally consists of glacial deposits overlying bedrock of Silurian and Devonian age. The bedrock consists of shale, siltstone, and sandstone, in the southern half of the basin, and limestone, dolomite, and gypsiferous shale in the northern half. The dissolved-solids concentration of precipitation in the Western Oswego River basin is about 10 mg/liter, whereas that of overland flow and high streamflow generally ranges from 50 to 300 mg/liter. The dissolved-solids concentration of the water commonly tapped by wells in the southern half of the basin generally ranges from 150 to 500 mg/liter; in the area north of the outcrop of the Onondaga Limestone, it generally ranges from 500 to more than 1,000 mg/liter. Highest concentrations were found in deeper wells and in the low-lying areas that are points of groundwater discharge. Heavy pumping in the northern part of the basin is likely to result in a deterioration of the chemical quality of the water except in those areas adjacent to the New York State Barge Canal, where better quality water may be induced to replace that pumped. No major groundwater quality problems are anticipted in the southern half of the basin. (Knapp-USGS)
W75-08515

SALINE GROUND-WATER RESOURCES OF LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W75-08517

WATER QUALITY OF THE LAKE SISKIYOU AREA AND A REACH OF UPPER SACRAMENTO RIVER BELOW BOX CANYON DAM, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif.
A. E. Dong, and R. L. Tobin.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-241 673, $3.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 15-73, September 1973. 40 p, 5 fig, 12 tab, 8 ref.

Descriptors: *Water quality, *Lakes, *California, Data collections, Chemical analyses, Water properties, Streams, Specific conductance, Dissolved oxygen, Nitrogen, Phosphorus, Coliforms, Water temperature, Streamflow, Water pollution sources, Thermocline.
Identifiers: *Lake Siskiyou area(Calif).

Periodic field and laboratory measurements of water quality in samples from streams tributary to Lake Siskiyou, from the lake itself, and from selected downstream sites near three sewage-disposal ponds indicated that water in most of the inflows, in the lake, and in the downstream reach of the Sacramento River contains low concentrations of nitrogen and phosphorus. Water samples from Wagon Creek and Cold Creek contain higher concentrations of nitrogen and phosphorus and have higher counts of total and fecal coliform bacteria than the water in samples from the other tributary streams. Analyses of samples from above and below the fish hatchery on Big Spring Creek (tributary to Cold Creek) indicate that the water downstream from the hatchery is higher in coliform bacteria counts, lower in dissolved oxygen, and higher in nitrogen and phosphorus concentrations. Thermal and dissolved oxygen stratification occur in Lake Siskiyou during the summer. In the Sacramento River below Lake Siskiyou, samples collected at sites downstream from the sewage effluent exhibit higher average concentrations of total phosphorus than samples from the upstream site. Concentrations of other constituents and coliform bacteria counts are similar in samples from sites upstream and downstream from the sewage effluent. (Woodward-USGS)
W75-08521

MICROBIOLOGICAL STUDY OF THE INFLUENCE OF CHALK ON POND MUD, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
M. Laurent, and J. Sechet.
Ann Hydrobiol. Vol 4, No 2, p 143-168, 1973. Illus. English summary.

Descriptors: Europe, *Mud, *Analyses, *Pollutant identification, *Industrial wastes, Bioindicators, Analytical techniques, Biological communities, Pollutants, *Sewage bacteria, Microorganisms, Chemical analysis.
Identifiers: Algae, Calcium carbonate, *Chalk, Characeae, *France(Leon Pond), Saprophobous organisms, Saproxeneous organisms, Saprophilous organisms.

The biological mechanisms resulting from the influence of CaCO3 on mud were studied. Research was carried out in the field, at Leon Pond (Landes, Frances), in relation to different kinds of factory wastes and municipal sewage being determined. The zones of pollution were determined according to the communities of indicator organisms and on the basis of chemical investigations. A number of species or organisms were classified into ecological groups: 1. saprophobous organisms, 2. saproxenous organisms, 3. saprophilous organisms and 4. saprobiontic organisms.--Copyright 1974, Biological Abstracts, Inc.
W75-08522

PB IN PARTICULATES FROM THE LOWER ATMOSPHERE OF THE EASTERN ATLANTIC,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-08531

ARTIFICIAL FOG PRODUCED BY INDUSTRIAL EMISSION OF WATER VAPOR (BROUILLARDS ARTIFICIELS PRODUITS PAR EMISSION INDUSTRIELLE DE VAPEUR D'EAU),
Quebec Univ., Chicoutimi. Centre de Recherche du Moyen Nord.
For primary bibliographic entry see Field 5A.
W75-08545

EFFECT OF ATMOSPHERIC STABILITY AND WIND DIRECTION ON WATER TEMPERATURE PREDICTIONS FOR A THERMALLY-LOADED STREAM,
Pennsylvania State Univ., University Park. School of Forest Resources.
D. R. DeWalle.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB=242 531, $3.75 in paper copy, $2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Completion Report, January 1975. 29 p, 5 fig, 5 tab, 14 ref. OWRT C-4199(No 9032)(1).

Descriptors: *Heat balance, Air circulation, Fetch, Temperature, Downstream, River flow, *Water temperature, *Thermal pollution, *Forecasting, *Pennsylvania, Equations, *Numerical analysis, Path of pollutants, River forecasting.
Identifiers: Thermal discharge, Downstream water temperature, *Heat exchange rate, *Evaporative heat exchange, Thermally loaded water bodies, Motion of the stream, Free convection, Numerical integration, direct integration, One-dimensional equation, *Susqehanna River(Penn).

A steady-state, one-dimensional equation was used to predict water temperatures in the West Branch Susquehanna River at a point 5.4-km downstream from a thermal discharge for 131 time intervals. Two methods were employed to integrate the equation to predict downstream water temperature: direct integration assuming a constant water surface heat exchange rate calculated from upstream water temperature and numerical integration with the heat exchange rate varying with temperature. Two equations were also used to compute evaporative heat exchange: the Jobson form of the familiar Lake Hefner equation derived under conditions of near-neutral stability and a Russian equation modified after Shulyakovskiy which included a correction for free convection. The direct integration method produced overestimates of heat loss and consequently underestimates of downstream water temperatures. Downstream water temperature prediction errors when the Hefner equation--numerical integration was used were large and well correlated with an index to atmospheric stability ($R2 > 46\%$). Prediction errors were smallest with the Russian equation--numerical integration combination and were not correlated with atmospheric stability ($R2 < 1\%$). (Sink-Penn State)
W75-08576

EXCHANGEABLE INORGANIC PHOSPHATE IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
W. C. Li.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 509, $5.75 in paper copy, $2.25 in microfiche. Ph.D. Thesis, 1974. 125 p, 15 tab, 6 fig, 67 ref. OWRT B-022-WIS(10), 14-01-0001-1961.

Descriptors: Sediments, *Phosphorus, *Nutrients, *Rooted aquatic plants, Phosphates, *Lake sediments, *Wisconsin, Water pollution sources.
Identifiers: *Myriophyllum spicatum, *Macrophytes.

The quantity of available P in selected sediments was evaluated by measurement of the amounts of P removed from sediments by Myriophyllum spicatum L. grown in columns containing sediment as the sole P source and amended with other essential nutrients. The relationships between the amount of sediment inorganic P added, the yield and P content of the plants, and the uptake of sediment inorganic P were evaluated. Available P comprised from 12.3 to 17.2% of total sediment inorganic P for the eight lake sediments investigated. Relationships between P uptake by Myriophyllum plants (micrograms phosphorus/gram of sediment) and the total inorganic phosphate, nonoccluded inorganic phosphate and total exchangeable inorganic phosphate contents of sediments were evaluated. Correlation coefficients were 0.99, 0.98, 0.97, respectively, for the dependent variables, namely, total inorganic phosphate, nonccluded inorganic phosphate and total exchangeable inorganic phosphate, indicating that each of these measurements provided a good index of available P in lake sediments. However, the uptake of sediment P by Myriophyllum plants arose mainly from the nonoccluded inorganic phosphate fraction (sodium hydroxide phosphate in calcareous sediments and ammonium fluoride plus sodium hydroxide phosphate in noncalcareous sediments), and most of the exchangeable inorganic P was contained in the nonoccluded inorganic phosphate fraction, indicating that available P was obtained mainly from the exchangeable inorganic P fraction. (Armstrong-Wisconsin)
W75-08577

MICROBIAL AVAILABILITY OF PHOSPHORUS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
A. Sagher.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 510, $5.75 in paper copy, $2.25 in microfiche. MS Thesis, 1974. 122 p, 18 fig, 24 tab, 48 ref. OWRT A-040-WIS(2), 14-31-0001-3550, 14-31-0001-3850.

Descriptors: Aquatic microorganisms, *Soil bacteria, *Phosphates, Lakes, *Soils, Phosphorus, *Wisconsin, *Scenedesmus, *Lake sediments, Water pollution sources.
Identifiers: *Selenastrum.

The microbial availability of phosphorus (P) in surficial sediments from diverse Wisconsin lakes was evaluated using Selenastrum and Scenedesmus and indigenous sediment populations as test organisms. Phosphorus-deficient algal cells were inoculated into monsterile sediment-water systems amended with all growth nutrients except phosphorus so that the sediment was the sole source of phosphorus (0.6 millegrams phosphorus per liter). The inoculated systems were incubated with intermittent shaking under standard light conditions until microbial biomass increases ceased (3 to 4 weeks), with periodic analysis for : (1) algal cell counts and ATP to provide data on microbial growth responses; (2) levels of dissolved ortho-inorganic phosphate (Pi), sodium hydroxide-extractable Pi, and hydrochloric acid-extractable Pi to provide information on the utilization of different sediment Pi forms. Appropriate controls were included to establish phosphorus deficiency in the test system and assess sediment organic phosphorus mineralization. All sediments supplied sufficient phosphorus to increase microbial biomass about two orders of magnitude. Between 51 and 80% of the sediment Pi was available to the microorganisms. Between 55 and 100% of the nonoccluded iron-bound fraction extracted with sodium hydroxide, but essentially none of the hydrochloric acid-extractable calcium-bound Pi fraction was available. Mineralization of sediment organic phosphorus was minimal.

W75-08578

BIOLOGICAL FEATURES OF INTERTIDAL COMMUNITIES NEAR THE U.S. NAVY SEWAGE OUTFALL, WILSON COVE, SAN CLEMENTE ISLAND, CALIFORNIA,
For primary bibliographic entry see Field 5C.
W75-08585

HEAT TRANSFER AND FLUID MECHANICS OF THE THERMAL POLLUTION PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
J. A. Schetz, C. J. Chien, and B. L. Sill.
A paper for the 5th International Heat Transfer Conference, (1974). 5 p, 5 fig, 14 ref. OWRR B-041-VA(4).

Descriptors: *Heat transfer, *Fluid mechanics, *Thermal pollution, Jets, Specific heat, Velocity, Viscosity, Thermal conductivity, Channel flow, Mixing.
Identifiers: Trajectory, Drag coefficient.

The results of a coordinated, three-pronged study of the development of the three-dimensional mixing zone produced by a heated discharge in a waterway are presented. An approximate analysis and a detailed computer solution procedure are developed, and the resulting predictions are compared with laboratory experiments.
W75-08599

THE OCCURRENCE OF BENTHOS DEEP IN THE SUBSTRATUM OF A STREAM,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W75-08602

NITRATE UPTAKE EFFECTIVENESS OF FOUR PLANT SPECIES,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. D. Warncke, and S. A. Barber.
Journal of Environmental Quality, Vol 3, No 1, p 28-30, Jan-Mar 1974. 2 tab, 5 ref. OWRR-B-026-IND(4).

Descriptors: *Soil-water-plant relationships, *Root systems, *Nitrates, Water quality, Absorption, Nutrients, Forage sorghum, Grain sorghum, Corn(Field), Soybeans, Bromegrass.
Identifiers: *Nitrate uptake.

The effectiveness of nitrate uptake of corn, soybeans, sorghum, and bromegrass intact roots were investigated in nutrient solution culture. The maximum uptake rate per centimeter of root for corn occurred at 10mM, for sorghum at 2.4mM, and for bromegrass at 0.8 mM. Increasing the nitrate level above 1.0 mM did not increase the growth rate during the first 3 weeks for any of these species. The minimum level to which the plant roots reduced the nitrate concentration was 1.7, 2.7, 2.4, and 1.4 micrometer for forage sorghum, grain sorghum, soybeans, and bromegrass, respectively. Three cultivars of corn were compared. Two reduced the nitrate level to 2 micrometer and the third to 4 micrometer. The results of this research indicate that the roots of the species investigated absorbed nitrate of maximum rates from relatively low nitrate concentrations provided the concentration was maintained. Also, the degree of reduction in nitrate level where nitrate in solution was not maintained indicated that these plant roots had the absorptive capacity to reduce solution nitrate to concentrations of 4 micrometer or less.
W75-08607

PLUTONIUM AND OTHER TRANSURANIUM ELEMENTS: SOURCES, ENVIRONMENTAL DISTRIBUTION AND BIOMEDICAL EFFECTS.
Atomic Energy Commission, Washington, D.C.

For primary bibliographic entry see Field 5C.
W75-08640

EFFECT OF INDIVIDUAL FACTORS ON THE FORMATION OF WATER QUALITY OF THE KARA KUM CANAL AS A WATER SUPPLY SOURCE OF THE TURKMEN SSR, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
G. I. Ovsyannikova.
Gig Sanit, 38(12): 99-100, 1973.

Descriptors: *Potable water, *Analysis, Canals, Conduits, Water pollution sources, *Water quality, *Pollutants, *Water supply, Water treatment.
Identifiers: Bacteriological studies, Dredging, Kara-Kum canal, *USSR(Turkman-SSR).

Investigations established that, with respect to physicochemical and sanitary-bacteriological indices, the quality of the water of the Kara-Kum canal (USSR) is suitable for use as a centralized drinking water supply after treatment and decontamination (2-fold chlorination at water works). Mineralization of the canal's water increases with distance from the intake, which was ascertained by the increase of chlorides, total hardness and alkalinity. The water quality of the canal is affected by the quality of the initial water (Amu-Darya River), its use for recreational purposes (swimming, fishing, boating, etc.), presence of cattle watering sites near banks, and by the operation of dredges.--Copyright 1975, Biological Abstracts, Inc.
W75-08644

DISPERSION AND MOVEMENT OF TRITIUM IN A SHALLOW AQUIFER IN MORTANDAD CANYON AT THE LOS ALAMOS SCIENTIFIC LABORATORY,
Los Alamos Scientific Lab., N. Mex.
W. D. Purtymun.
Available from the National Technical Information, Springfield, Va 22161 as LA-5716-MS, $4.00 in paper copy, $2.25 in microfiche. Rept No LA-5716-MS, September 1974. 10 p, 5 fig, 2 tab, 2 ref.

Descriptors: *Tritium, *Effluents, *Water pollution, *Aquifers, Movement, *Dispersion, Groundwater reservoir, Measurement, Canyons, Radioactive tracer, Evapotranspiration, Soil moisture, *Path of pollutants.

Twenty (20) Ci of tritium discharged into Mortandad Canyon in November 1969 were used to determine the dispersion and movement of the tritium in a shallow aquifer in the alluvium. It took 388 days for the peak concentration to move 3 027 m from the effluent outfall to the eastern end of the aquifer. The concentration decreased from 77 700 pCi/ml to 310 pCi/ml in that distance. Ground water is transit storage contained about 0.9 Ci of tritium prior to the release of the 20Ci. About 3.9 Ci of tritium remained in transit storage at the end of 1970. The remaining 17.0 Ci were lost with evapotranspiration, infiltration with ground water into the underlying tuff or suspended with soil moisture above the aquifer. (Houser-ORNL)
W75-08645

STUDIES OF PLUTONIUM, AMERICIUM, AND URANIUM IN ENVIRONMENTAL MATRICES,
Los Alamos Scientific Lab., N. Mex.
W. H. Adams, J. R. Buchholz, C. W. Christenson, G. L. Johnson, and E. B. Fowler.
Available from the National Technical Information Service, Springfield, Va 22161 as LA-5661, $4.00 in paper copy, $2.25 in microfiche. Rept No LA-5661, January 1975. 24 p, 16 tab, 36 ref.

Descriptors: *Environment, *Plutonium, *Uranium, Acids, Oxides, Dissolved solids, Salts, Soils, Separation techniques, Anion adsorption, Ion exchange, Absorption, Field crops, Environmental effects.

Identifiers: *Matrices, *Americium.

A nitric acid-hydrofluoric acid treatment for dissolution of plutonium oxides in soils has been developed; its adaption to other biological matrices is discussed. Plutonium recoveries of 94 to 99% from 1 - g samples of spiked and heated soils are reported. Adaptation of the acid solution to subsequent anion exchange separation of plutonium, followed by coupling to known electroplating techniques, is described. The uptake of plutonium, americium, and uranium from spiked soils by alfalfa, beans, radishes, lettuce, tomatoes, and barley is reported. The 'apparent' solubility of 238PuO2 in tap water was measured, and the deposition of plutonium in fish, algae, and snails in aquaria containing 238PuO2 microspheres is reported. (Houser-ORNL)
W75-08646

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE COOPER NUCLEAR STATION AUGUST 1972,
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W75-08648

COMMERCIAL ALPHA WASTE PROGRAM QUARTERLY PROGRESS REPORT JULY - SEPTEMBER 1974,
Hanford Engineering Development Lab., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-08651

TRITIUM AND NOBLE GAS FISSION PRODUCTS IN THE NUCLEAR FUEL CYCLE. I. REACTORS,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5A.
W75-08652

ANALYSIS OF POPULATION, BIRTH, AND DEATH STATISTICS IN THE COUNTIES SURROUNDING THE BIG ROCK POINT NUCLEAR POWER STATION, CHARLEVOIX COUNTY, MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W75-08653

LIQUID PLUGGING IN IN-SITU COAL GASIFICATION PROCESSES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-08657

PROJECT DIAMOND ORE, PHASE IIA: CLOSE-IN MEASUREMENTS PROGRAM,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-08659

FURTHER NUMERICAL MODEL STUDIES OF THE WASHOUT OF HYGROSCOPIC PARTICLES IN THE ATMOSPHERE,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-08660

A DIRECT SOLUTION OF THE SPHERICAL-HARMONICS APPROXIMATION TO THE TRANSFER EQUATION FOR A PLANE-PARALLEL, NONHOMOGENEOUS ATMOSPHERE,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-08661

ENVIRONMENTAL RADIOACTIVITY IN THE FAROES IN 1973,
Danish Atomic Energy Commission, Risoe. Research Establishment.
For primary bibliographic entry see Field 5A.
W75-08663

ENVIRONMENTAL RADIOACTIVITY IN GREENLAND IN 1973,
Danish Atomic Energy Commission, Risoe. Research Establishment.
For primary bibliographic entry see Field 5A.
W75-08664

NATURAL RADIATION EXPOSURE IN THE UNITED STATES,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5A.
W75-08669

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT, ECOLOGY, JANUARY - DECEMBER 1973,
Argonne National Lab., Ill.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No ANL-8060, Part III, $7.60 in paper copy, $2.25 in microfiche. Rept No ANL-8060, Part III, (1973), 187 p.

Descriptors: *Environmental effects, Ecology, Ecological distribution, *Radioecology, *Great Lakes, *Radioactivity, *Research and development, *Thermal pollution, Nuclear powerplants, Effluents, Water pollution, Tritium, Thermal stress, Trace elements, Radioisotopes, Fish migration, Air pollution, Crop response, Economic impact.
Identifiers: *Terrestrial ecology, Terrestrial ecosystems, Thermal discharges, Radiotelemetry, Sulfur dioxide, Biogeochemical cycling.

The Ecology Section, comprising the Great Lakes Radioecology, Thermal Studies, and Terrestrial Ecology Groups, has the overall objective of predicting the environmental behavior and ecological effects of energy-related effluents in the Great Lakes region. The Great Lakes Radioecology Group continued investigations of toxic trace elements and of radionuclides in the Great Lakes, with emphasis on natural radionuclides and long-lived artificial ones in Lake Michigan. This program on the biogeochemical cycling of these elements in a joint effort between Argonne and the University of Michigan's Great Lakes Research Division. The Great Lakes Thermal Studies Group continued studies of the effects of heated discharges from the Point Beach Nuclear Power Plant on Lake Michigan fish. The group recently has concentrated its efforts on development of radiotelemetry methods for tracking the movements of fish in the vicinity of thermal discharges. The Terrestrial Ecology Group completed studies of the effects of heated water below Budapest. Comparisons are made study because of its current and projected importance as an air pollutant in the northeastern part of the United States. (Houser-ORNL)
W75-08670

TOTAL URBAN WATER POLLUTION LOADS: THE IMPACT OF STORM WATER,
Enviro Control, Inc., Rockville, Md.
A. M. Vitale, and P. M. Sprey.
Available from the National Technical Information Service Springfield, Va. 22161, as PB-231 730. $7.00 in paper copy, $2.25 in microfiche. Report submitted to Council on Environmental Quality, Washington, D.C. 1974. 183 p, 87 tab, 81 fig, 24 ref, 2 append.

Descriptors: *Storm water, *Storm runoff, *Water pollution sources, Water quality, Cities, Surface runoff, Urban runoff, Storm drains, Combined sewers, Separated sewers, *Delaware River.

This analysis of engineer survey data from eight cities and the effects of storm events on water quality in the Delaware river estuary, estimates the quantities of pollutants entering receiving waters from cities, determines the portions that can be attributed to other than sewage treatment plants, especially storm water related sources, compares the cost and effectiveness of alternative methods of reducing pollution from storm water, and discusses the implication for policy decisions. Major findings of the study included: a large part of the water pollution load created by urban areas results from storm associated surface runoff, storm sewer discharges, sewer overflows, sewer leaks and treatment plant bypasses; pollutant materials include oxygen demanding material, settleable solids, nutrients, heavy metals and other toxic substances, and pathogens and bacteria; urban storm water has a severe impact on dissolved oxygen content in the receiving water; the pattern of storm events is such that the oxygen demand from urban runoff occurs both infrequently and intensely; and the average oxygen depletion due to typical storm events reaches 2 ppm, and the depletion lasts for substantial periods of time--from 8 to 12 days. Policy implications of this study include: both water quality planning and water pollution abatement programs need to be based on an analysis of the total urban pollution loads; municipalities need more federal incentive to identify and perform the comparatively inexpensive and cost effective sewer inspection, cleaning, and maintenance programs which could significantly reduce the discharge of pollutants; and, sewer separation is not a cost effective approach to the storm water problem. (Orr-FIRL)
W75-08677

STORMWATER POLLUTION--SAMPLING AND MEASUREMENT,
Trent Polytechnic, Nottingham (England). Dept. of Building and Civil Engineering.
For primary bibliographic entry see Field 5A.
W75-08678

THE CONFIGURATION OF THE HYDROCHEMICAL RELATIONSHIPS IN THE HUNGARIAN SECTION OF THE DANUBE DURING THE YEAR 1971: DANUBIALIA HUNGARICA LXVI, (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest (Hungary). Station for Danube Research.
Z. T. Dvihally.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 15: 23-30. 1973.

Descriptors: *Rivers, Europe, *Analysis, *Pollutants, Water pollution sources, *Path of pollutants, Nitrates, Nitrites, Dissolved oxygen, Iron.
Identifiers: *Danube River, *Hungary.

While the amounts of O2 consumption, nitrite, ammonium, dissolved CO2 and dissolved Fe have steadily grown since 1965, the amount of dissolved O2, the O2 saturation and the absolute values of the nitrate and silicate ions have diminished, indicating a qualitative deterioration of the Danube water below Budapest. Comparisons are made between the O2 balance of non-polluted Hungarian sections of the Danube and the German Rhine, Main and Danube Rivers. The O2 production in the upper water layers of the Hungarian Danube is 6-14 g O2/m3 or 1100-1740 tons O2 daily, whereas the average primary production of the German rivers is 3-4 g O2/m3.--Copyright 1975, Biological Abstracts, Inc.
W75-08680

CHARACTERISTICS OF THE ORGANIZATION OF SANITARY CONTROL OF WATER SUPPLY

SOURCES AND DRINKING WATER QUALITY IN THE OIL AND GAS-BEARING REGIONS IN THE NORTHERN OBTERRITORY, (IN RUSSIAN),
Tyumenskii Gosudarstvennyi Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5F.
W75-08681

A COMPUTATIONAL MODEL FOR PREDICTING THE THERMAL REGIMES OF RIVERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, and J. F. Kennedy.
Report 169, November 1974. 61 p, 2 fig, 7 ref, 2 append.

Descriptors: *Thermal pollution, *Numerical analysis, *Rivers, *Unsteady flow, *Heat budget, Analysis, Energy, Duffusion, Convection, Equations, Temperature, Distribution, Inflow, Heat flow, Analytical techniques, *Path of pollutants.
Identifiers: Convective-diffusion equation, Implicit predictor-corrector method.

A predictor-corrector type of numerical procedure for solving the unsteady one-dimensional convective-diffusion equation was developed to predict unsteady streamwise temperature distributions in natural and thermally loaded rivers. Input data required for the computations included river flow rates, channel characteristics, climatic conditions, tributary inflows, and thermal discharges. The model was developed for application in cases with unsteady thermal input rates and climatic conditions. (Adams-ISWS)
W75-08683

NUMERICAL ANALYSIS OF WARM, TURBULENT SINKING JETS DISCHARGED INTO QUIESCENT WATER OF LOW TEMPERATURE,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J. M. Pena, and S. C. Jain.
Report 154, February 1974. 76 p, 9 fig, 8 ref, 1 append.

Descriptors: *Jets, *Numerical analysis, *Design data, *Thermal pollution, Diffusion, Temperature, Velocity, Froud number. Turbulent flow, Winter, Density, Outlets, Profiles, Water temperature, *Path of pollutants.
Identifiers: *Sinking jets.

A numerical analysis of sinking jets in quiescent water of low temperature was conducted. Jets from circular nozzles and two-dimensional slots were considered. The integral approach and similarity conditions for velocity and temperature profiles were used in the analysis. Results were presented in graphical form for jet trajectory, width, and dilution. These graphs were to be used in predicting the behavior of warm, submerged jets discharging into lakes during the winter season when the lake water temperature is near the freezing point. (Adams-ISWS)
W75-08684

ON THE TIME-DEPENDENT FLOW IN A LAKE,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 2H.
W75-08703

THE EFFECTS OF DOMESTIC AND INDUSTRIAL EFFLUENTS ON A LARGE TURBULENT RIVER,
Alberta Univ., Edmonton. Dept. of Zoology.
C. G. Paterson, and J. R. Nursall.
Water Research, Vol 9, No 4, p 425-435, April 1975. 6 fig, 8 tab, 34 ref.

Descriptors: *Rivers, *Pollutants, *Effluents, Limnology, Climates, Flow, Ice cover, Chemical analysis, Benthic fauna, Fish populations, Temperature, Biochemical oxygen demand, *Path of pollutants, On-site investigations, *Canada.
Identifiers: *North Saskatchewan River.

The North Saskatchewan River receives effluents largely from its south bank. Consequently the north side of the river is little affected and useful N-S comparisons can be made along transects. Dissolved oxygen values stay high in all parts of the river at all seasons. BOD is low and steady along the north side, higher and variable along the south side. Nitrogen, phosphorus, and other chemical parameters generally measured higher along the south side. There was much more benthic variety along the north side of the river. Fish stayed to the north side. There was a general biomass increase through the region affected by effluents, demonstrating a pollutional eutrophication. It was suggested that the oligochaete-chironomid biota of the south side of the river is governed by short term, restricted area pollutional events, which are difficult to anticipate to measure. (Sims-ISWS)
W75-08709

COASTAL POWER PLANT HEAT DISPOSAL CONSIDERATIONS,
Southern California Edison Co., Rosemead, Calif.
For primary bibliographic entry see Field 5G.
W75-08719

POLLUTION OF OPEN WATERS BY PESTICIDES ENTERING FROM AGRICULTURAL AREAS, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
Ya. I. Kostovetskii, G. V. Tolstopyatova, and G. Ya. Chegrinets.
Gig Sanit, 38(10): 99-100, 1973.

Descriptors: *Water pollution sources, *Pesticides, Runoff, Surface runoff, *Agricultural runoff, DDT, *Soil contamination, Pollutants, *Path of pollutants, Soil analysis.
Identifiers: Arylam, Cresol, Lindane, Malathion, Parathion, Trichlorfon, USSR, Sevin.

A determination was made of the content of DDT, lindane, Sevin (arylam), 4,6-dinitro-o-cresol, methyl parathion, malathion and trichlorfon in soils of fields and orchards and in waters and bottom deposits of ponds and rivers adjacent to them. Of 456 analyses (soil), 224 water analyses, and 216 analyses of bottom deposits, pesticides were found respectively in 97 (21.3%), and 16 (7.1%) and 54 (25%) of the cases. Primarily organochlorine pesticides were found in the soil and bottom deposits (in 92.9% and 85.2% of the cases) and organophosphorus compounds in the waters (in 75% of the cases). These differences were evidently due to the investigated agricultural areas being treated more often with organophosphorus pesticides which probably entered the waters with the surface runoff.--Copyright 1975, Biological Abstracts, Inc.
W75-08729

THE RADIOACTIVE, METALLIC AND BACTERIAL POLLUTANTS IN THE ESTUARY OF THE ESCAUT (SCHELT) RIVER AND ON THE COAST OF BELGIUM, (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels. Lab. for Oceanographic Physics.
For primary bibliographic entry see Field 5A.
W75-08774

ECONOMIC AND ENVIRONMENTAL EVALUATION OF NUCLEAR WASTE

DISPOSAL BY UNDERGROUND IN SITU MELTING,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5E.
W75-08785

MODELING WIND INDUCED WATER CURRENTS,
Worcester Polytechnic Inst., Mass. Alden Research Labs.
G. E. Hecker, and G. A. Yale.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 335-348, 1973. 7 fig, 14 ref, 1 append.

Descriptors: *Model studies, *Currents(Water), *Winds, Hydraulic models, Hydraulic similitude, Waves(Water), Froude number, Reynolds number, Scaling, Shear stress, Research facilities, Hydraulics, Path of pollutants.
Identifiers: Surface slope.

The movement and concentration of surface contaminants in slow moving water bodies may be affected by wind induced currents. Modeling of wind-water interaction may also be relevant to other studies such as the effects of ambient circulation patterns on surface vortices at intakes and changes of flow patterns in cooling ponds. A review of the available literature indicated that considerable scale effects would occur when simulating wind induced currents by small Froude scale models. In addition, it was shown that simulation of surface slopes and shear stresses does not guarantee scaling of wind induced currents. Experiments were conducted to evaluate the induced surface current relative to the wind at low Reynolds numbers, and information was presented which allows the proper model wind speed to be selected without the need for field data. Of three basic methods used to simulate wind induced currents, the approach based on available laboratory versus field data on the ratio of surface currents to wind speed is most useful since it requires no additional field data. However, any simulation of wind induced currents in small Froude models involves scale effects. Such scale effects were evaluated and data were presented which allow the proper model wind speed to be selected. (See also W75-08786) (Sims-ISWS)
W75-08816

POLLUTION POTENTIAL OF A SANITARY LANDFILL NEAR TUCSON,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson, and G. G. Small.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 427-436, 1973. 1 fig, 3 tab, 16 ref, 1 append.

Descriptors: *Landfills, *Water quality, *Water pollution sources, Leachate, *Path of pollutants, Waste disposal, Solid wastes, Water pollution, Pollutant identification, Ephemeral streams, Water analysis, Perched water, Groundwater, *Arizona.
Identifiers: Tucson(Ariz), Santa Cruz River(Ariz).

A study was started in July 1972 to determine the quality of leachate produced in the Ina Rd sanitary landfill, near Tucson, and to monitor the effect of such leachate on groundwater quality. The landfill site lies along the Santa Cruz River, an ephemeral stream. The first few months of study involved conducting a geophysical investigation, determining river intake rates during low flows of sewage effluent, monitoring water level changes in wells, and analyzing samples of river and well water. A

shallow clay lens was inferred at the site, based on the geophysical survey. Apparently, groundwater mounds develop on this lens, but interactions with landfill deposits occur only during recharge from storm runoff events. Leachate generated within the fill closely reflected the quality of river water. The total soluble salt levels were less than 700 mg/l; nitrate and BOD levels were low. Concentrations of certain trace metals were above recommended levels, but presumably sorption would inhibit the movement of these metals into water bearing materials at 70 ft. Concentrations of certain constituents within samples from a 100 ft well were higher than corresponding levels in other wells. It was concluded that, to date, the leachate produced in the landfill near the sampling well does not represent a pollution hazard. Further observations are required, however, to follow the quality of leachate during the 'aging' of the deposits at the well site. (See also W75-08786) (Sims-ISWS)
W75-08823

WASTEWATER RECLAMATION AND RECHARGE, BAY PARK, N.Y.,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5D.
W75-08827

STREAM RECONNAISSANCE FOR NUTRIENTS AND OTHER WATER-QUALITY PARAMETERS, GREATER PITTSBURGH REGION, PENNSYLVANIA,
Geological Survey, Carnegie, Pa.
For primary bibliographic entry see Field 5A.
W75-08835

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, RED RIVER BASIN, DORCHEAT BAYOU, SEGMENT 1A,
Geological Survey, Little Rock, Ark.
J. E. Reed, E. E. Morris, B. F. Lambert, and M. S. Hines.
Open-file report, 1975. 107 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilation capacity.
Identifiers: *Dorcheat Bayou(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 1A of the Red River water-quality management planning basin. The water-quality model was calibrated for disssolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists of a 49-mile reach of Dorcheat Bayou and its principal tributaries. Dischargers in the segment consist of 9 municipalities, including Southern State College, and 4 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (C1), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentrations of all the above mentioned chemical constituents in Dorcheat meet standards by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (C1), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08837

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, RED RIVER BASIN, SEGMENT 1B,
Geological Survey, Little Rock, Ark.
J. E. Reed, J. E. Terry, J. W. Stephens, and M. E. Broom.
Open-file report, 1975. 63 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *Red River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 1B of the Red River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists of about a 163-mile reach of the Red River, and its principal tributaries in this reach. Dischargers in the segment consist of 5 municipalities and 3 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentrations of all the above chemical constituents in the Red River meet standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08838

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, BOEUF RIVER AND BAYOU MACON, SEGMENT 2A,
Geological Survey, Little Rock, Ark.
J. E. Terry, E. E. Morris, B. F. Lambert, and R. Sniegocki.
Open-file report, 1975. 120 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Arkansas, *Path of pollutants, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *Boeuf River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 2A of the Ouachita River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists of the upper reaches of Boeuf River and Bayou Macon. Including their main-stem tributaries, Boeuf River and Bayou Macon in this segment are, respectively, about 125 miles and 76 miles in length. Dischargers in the segment consist of 9 municipalities and 2 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow

conditions are given. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (CO4) for each discharger are summarized. (Knapp-USGS)
W75-08839

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, BAYOU BARTHOLOMEW, SEGMENT 2B,
Geological Survey, Little Rock, Ark.
J. E. Reed, J. E. Terry, B. F. Lambert, and E. E. Morris.
Open-file report, 1975. 70 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *Bayou Bartholomew(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 2B of the Ouachita River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists chiefly of a 284-mile reach of Bayou Bartholomew, a 21-mile reach of Overflow Creek, and a 24-mile reach of Chemin-a-Haut Creek. Dischargers in the segment consist of seven municipalities. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08840

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SEDMENT 2D,
Geological Survey, Little Rock, Ark.
J. E. Reed, J. E. Terry, J. W. Stephens, and C. T. Bryant.
Open-file report, 1975. 189 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *Ouachita River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 2D of the Ouachita River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists chiefly of a 148-mile reach of the Ouachita River, and its principal tributaries in this

reach including the Little Missouri River and Smackover Creek. Dischargers in the segment consist of nineteen municipalities and seven industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentrations of all the above chemical constituents in the Little Missouri River meet standards set by the State of Arkansas. (Knapp-USGS)
W75-08841

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SALINE RIVER, SEGMENT 2C,
Geological Survey, Little Rock, Ark.
J. E. Reed, B. F. Lambert, E. E. Morris, and J. W. Stephens.
Open-file report, 1974. 75 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *Ouachita River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 2C of the Ouachita River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment includes the complete 202-mile reach of the Saline River and selected reaches of its principal and minor tributaries. Dischargers in the segment consist of 7 municipalities and 6 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. (Knapp-USGS)
W75-08842

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SEGMENT 2F,
Geological Survey, Little Rock, Ark.
C. T. Bryant.
Open-file report, 1975. 216 p, 3 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *Ouachita River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 2F of the Ouachita River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists chiefly of a 220-mile reach of the Ouachita River, a 40-mile reach of the South Fork Ouachita River, and a 70-mile reach of the Caddo River. Dischargers in the segment consist of 8 mu-

nicipalities and 34 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentration of dissolved oxygen, total dissolved solids, chlorides, and sulfates in Caddo River meet standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08843

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, SEGMENT 5A,
Geological Survey, Little Rock, Ark.
J. E. Terry, E. E. Morris, B. F. Lambert, and M. S. Hines.
Open-file report, 1975. 52 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity.
Identifiers: *St. Francis River(Ark), *Waste-load allocation.

Data and the results of a waste-load allocation study are presented for Segment 5A of the St. Francis River water-quality management planning basin. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years (Q7-10). The segment consists chiefly of a 64-mile reach of the St. Francis River, and its principal tributaries in this reach. Dischargers in the segment consist of three municipalities. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditons are given. The plots show that under the specified conditions the concentrations of all the above chemical constituents in the St. Francis River meet standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-08844

EVALUATION OF METHODS FOR ESTIMATING STREAM WATER QUALITY PARAMETERS IN A TRANSIENT MODEL FROM STOCHASTIC DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
K. P. R. Krishnan, J. J. Lizcano, L. E. Erickson, and L. T. Fan.
Water Resources Bulletin, Vol 10, No 5, p 899-913, October 1974. 6 fig, 8 tab, 10 equ, 15 ref. OWRT B-021-KAN(10).

Descriptors: *Streams, *Water quality, *Estimating, Stochastic processes, Water pollution control, Measurement, Computers, Evaluation, Data collections, Equations, Biochemical oxygen demand, Wastes, Mathematical models, Systems analysis.
Identifiers: *Parameter estimation, *Bard's method, *Simplex search method, Transient model, Input-output data, Least square criterion function, Minimization, Standard deviation.

The estimation of parameters in water quality models represented by linear first order partial differential equations is investigated. Two sets of simulated input-output data, one with input noise and the other with output measurement error, were used. BOD parameters from simulated data measured at two locations along a stream were estimated by a gradient technique (Bard's method) and a pattern search technique. The results indicate that the output measurement error significantly affects the values of parameter estimates as compared to the noise added to the input. Bard's method consistently gave results with a smaller sum of square value. (Bell-Cornell)
W75-08849

METER FOR SEWER FLOW MEASUREMENT,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W75-08850

5C. Effects Of Pollution

EFFECT OF BEAN POD MOTTLE VIRUS ON YIELD COMPONENTS AND MORPHOLOGY OF SOYBEANS IN RELATION TO SOIL WATER REGIMES: A PRELIMINARY STUDY,
Mississippi State Univ., State College.
D. L. Mynre, H. N. Pitre, M. Haridasan, and J. D. Hesketh.
Plant Dis Rep, Vol 57, No 12, p 1050-1054, 1973. Illus.

Descriptors: *Soybeans, *Soil moisture, *Plant diseases, Plant fungi, Crop production, *Viruses.
Identifiers: Bean pod mottle virus.

The yield components and morphology of 'Bragg' soybeans naturally infected with bean pod mottle virus (BPMV) prior to bloom and grown under different soil water regimes were compared with those of healthy plants growing adjacent to a diseased plant under the same conditions in field plots. Healthy plants yielded higher than diseased plants, irrespective of the soil water regimes. BPMV infection reduced yield by 29%. BPMV infection was more detrimental than the imposed soil water stress during the growing season. A soil water stress coupled with BPMV infection further decreased yield. Lower yields caused by infection were reflected in a reduction in total dry matter and total number of fruiting sites and pods per plant. Plant height, number of pods per fruiting site, number of seeds per pod, and mean weight of seeds were not affected by BPMV infection.--Copyright 1974, Biological Abstracts, Inc.
W75-08359

BEHAVIORAL RESPONSES OF NORTHERN PIKE, YELLOW PERCH AND BLUEGILL TO OXYGEN CONCENTRATIONS UNDER SIMULATED WINTERKELL CONDITIONS,
Ichthyological Associates, Inc., Middletown, Del.
B. R. Petrosky, and J. J. Magnuson.
Copeia, Vol 1973, No 1, p 124-133, Illus. 1973.

Descriptors: Oxygen, *Pikes, Yellow perch, Perches, Sunfiches, *Fish physiology, Winter killing, *Environmental effects, *Fish, *Cold regions, *Fish behavior, Fishkill, Morbidity, Fish management, Water pollution effects.
Identifiers: Bluegill, Esox-lucius, Lepomis-macrochirus, Perca-flavescens.

Northern pike (Esox lucius), yellow perch (Perca flavescens), and bluegill (Lepomis macrochirus) were exposed to successively lower O2 concentrations 4.0, 2.0, 1.0, 0.5 and 0.25 mg/l) each day for 5 days in aquaria sealed above with simulated 'ice'. Water temperature varied from 2.5-4.0C, and light intensity and photoperiod simulated conditions in an ice-covered lake. Gill ventilation rates increased in response to lowered O2, doubling for bluegill and yellow perch but quadrupling for

northern pike. Maximum ventilation rates occurred at 0.5 mg/l D.O. (dissolved oxygen) for northern pike and yellow perch and at 1.0 mg/l D.O. for bluegill. Locomotory activity was greatest at 0.25 mg/l D.O. for northern pike but at 0.5 mg/l D.O. for yellow perch and bluegill. Northern pike and yellow perch began to move toward the ice at 0.5 mg/l D.O. At 1.0 mg/l D.O., bluegill kept sinking to the bottom of the aquaria; they continually made forays upward only to sink again. Northern pike and yellow perch nosed at the under surface at the ice at the lowest O2 concentrations while bluegill seldom did. The fish never aggregated more than 10% of the time even at the lowest concentrations of dissolved O2. Almost all northern pike and yellow perch were still alive at 0.25 mg/l D.O. while all bluegill were dead. Evidently northern pike are best adapted for survival in winterkill lakes and bluegill the least. The upward movement takes the fish to the highest O2 available in the immediate vicinity. Detection of an O2 gradient is not a requirement of this response because in the aquaria the fish move to the ice at low O2 concentrations in absence of a gradient. High free CO2 and dissolved H2S are also not necessary to stimulate or orient the upward movement. Increased locomotory activity, coupled to reduced activity when respiratory distress is alleviated, also provides an effective mechanism for locating higher O2.--Copyright 1973, Biological Abstracts, Inc.
W75-08361

THREE NEW SPECIES OF PARACINETA (PROTOZOA: SUCTORIA) FROM MOBILE BAY, ALABAMA,
University of South Alabama, Mobile. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W75-08363

NEW SPECIES OF PROTOZOA FROM MOBILE BAY, ALABAMA,
University of South Alabama, Mobile. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W75-08364

THE CONTRIBUTION OF AGRICULTURE TO EUTROPHICATION OF SWISS WATERS: I. RESULTS OF DIRECT MEASUREMENTS IN THE DRAINAGE AREA OF VARIOUS MAIN DRAINAGE CHANNELS,
Eidgenoessische Technische Hochschule, Kastienbaum (Switzerland). Hydrobiology Lab.
For primary bibliographic entry see Field 5B.
W75-08376

SEAWEEDS: THEIR PRODUCTIVITY AND STRATEGY FOR GROWTH,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
K. H. Mann.
Science, Vol 182, No 4116, p 975-981, December 7, 1973. 5 fig, 2 tab, 57 ref.

Descriptors: *Primary productivity, *Biomass, *Kelps, Water temperature, Predation, Seasonal, Growth rates, Light, Nutrients, Marine plants, Plant ecology, Food chains, Lobsters, Food habits, Population, Standing crops, *Canada.
Identifiers: *Growth strategy, Laminaria longicruris, Laminaria digitata, Agarum cribrosum, Nova Scotia, Seaweeds, Sea urchins, *St. Margaret's Bay(NS).

As part of a multidisciplinary study at St. Margaret's Bay, Nova Scotia, a systematic study of the seaweed zone along approximately 50 km of the shoreline was carried out with the aid of a research submarine and scuba gear. It was found that algal zones dominated by Laminaria and Agarum accounted for over 80 percent of the total biomass of seaweeds in the bay. To investigate the

rate of biomass turnover, 180 plants (L. longicuris, L. digitata, A. cribrosum) at five sites with different water depths and wave actions were tagged for identification, and holes punched in the blades. The movement of these holes showed that all growth in length occurred at the junction of the stipe and the blade. Over a 2-yr period, all three species completely renewed the tissue between one and five times a year. The biomass of the new tissue was up to 20 times the initial biomass of the blade. Furthermore, peak growth occurred in late winter or early spring when the water temperature was close to 0C. Primary productivity was estimated to be 1750 g C/sq m/yr, and in the Bay, seaweed production was about 3 times that of phytoplankton. Comparison of results from other areas shows that the productivity of seaweeds is as high or higher than that of the most productive terrestrial systems. Study of the growth strategy of seaweeds, especially at low light and temperature levels seems to indicate that kelps are capable of storage, translocation, and mobilization of carbon reserves. However, the theory of energy translocation from an old frond to a new one does not describe the growth of species in eastern Canada since these plants replace old fronds at least once in the winter. It is suggested that the anaerobic mud surrounding the roots provides nitrogen in sufficient amounts to make the plants independent of atmospheric N. Less than 10 percent of the kelp production normally enters grazing food chains; the remainder enters detritus food chains, having been released as particulate or dissolved organic matter. It is postulated that human predation on lobsters has allowed sea urchin populations to increase which in turn destroy portions of kelp forests. (Little-Battelle)
W75-08377

PROBIT TRANSFORMATION: IMPROVED METHOD FOR DEFINING SYNCHRONY OF CELL CULTURES,
Carnegie Institution of Washington, Stanford, Calif. Dept. of Plant Biology.
For primary bibliographic entry see Field 5A.
W75-08378

MODELLING PRIMARY PRODUCTIN IN WATER BODIES: A NUMERICAL APPROACH THAT ALLOWS VERTICAL INHOMOGENEITIES,
Fisheries Research Board of Canada, Winnipeg, (Manitoba). Freshwater Inst.
E. J. Fee.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1469-1473, October 1973. 4 fig, 11 ref.

Descriptors: *Algae, *Primary productivity, *Mathematical models, Photosynthesis, Light, Biomass, Depth, Equations, Phytoplankton, Mathematical studies, Model studies, Eutrophication.

A new model for computing integral daily phytoplankton primary production is described. The model incorporates vertical variations of algal biomass, complex photosynthesis vs light responses, nonexponential extinction of light vs depth, and any distribution of surface light over a day. The basic approach is to combine measured relations for photosynthetic rate vs light, light vs depth, and light vs time in an interpolative scheme rather than attempting to fit equations to the data and using the resulting equations to obtain a mathematical solution. The model is general and should have wide applicability. Model predictions agreed well with in situ measurements of production. (Little-Battelle)
W75-08379

TEMPERATURES SELECTED SEASONALLY BY FOUR FISHES FROM WESTERN LAKE ERIE,
Ohio State Cooperative Fishery Unit, Columbus.
C. A. Barans, and R. A. Tubb.

Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1697-1703, November 1973. 2 fig, 22 ref.

Descriptors: *Water temperature, *Thermal pollution, *Yellow perch, *White bass, Seasonal, Water pollution effects, Bioassay, Shiners, *Lake Erie.
Identifiers: Temperature selection, Acclimatization, *Smallmouth bas, *Emerald shiner.

When four species of fish were taken from western Lake Erie in each of four seasons and held usually for less than 7 days at ambient lake temperatures, the temperatures they selected during 2-3 days in a horizontal temperature gradient differed seasonally. The differences were largely attributable to the conditions at which the fish had been acclimatized in the lake and were modified by acclimation during 2-3 days in the gradient. The selected temperatures provided insights into the temperatures that might be selected by these species each season if the lake basin or other waters with similar seasonal ambient temperatures were subjected to thermal discharges. Temperatures selected were above ambient lake temperatures except for emerald shiners (Notropis atherinoides) in summer and fall. In general, white bass (Morone chrysops) and smallmouth bass (Micropterus dolomieui) selected a high range in temperatures throughout the year (18-30 C and 18-31 C, respectively), yellow perch (Perca flavescens) an intermediate range (10-29 C) and emerald shiners the lowest range (6-23 C). Three of the species were distributed within a relatively precise temperature range in the summer and within a larger range during other seasons; emerald shiners selected a narrow range during all seasons. A fairly stable temperature preference was usually reached within several hours in summer, but the temperatures selected by three species generally increased with time in the gradient during the other seasons; emerald shiners selected constant temperatures in all seasons. Temperatures selected by young and adults differed mainly in yellow perch and emerald shiners in summer and winter, when the lake temperatures fluctuated least. (Little-Battelle)
W75-08381

NEMATODES OF LAKE BALATON: III. THE FAUNA IN LATE-SUMMER,
Research Inst. for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
Kalman Biro.
Ann Inst Biol (Tlhany) Hung Acad Sci, 39 p 89-100, 1972. Illus.
Identifiers: Achromadora-terricola, Biomass, *Bottom sediments, Dorylaimus-helveticus, *Fauna, *Hungary(Lake Balaton), Ironus-tenuicaudatas, Lakes, Microlaimus-globiceps, Monhystera-paludicola, *Nematodes, Paraphanolaimus-anistsi, Paraphanolaimus-behningi, Paraplectonema-pedunculatum, Summer, Theristus-setosus, Tobrilus-helveticus.

The qualitative and quantitative composition of nematodes in the bottom sediment of the open water of Lake Balaton (Hungary) in late-summer, 1968, was studied. Two new species were found for the Hungarian fauna: Microlaimus globiceps De Man and Paraphanoliamus anisitsi (Dad.) Andrassy. Achromadora terricola De Man, Dorylaimus helveticus Steiner, Tobrilus helveticus Hofm. found in the collections are new species for Lake Balaton. The most frequent 5 nematodes were: Paraplectonema pedunculatum S., Paraphanolaimus behningi M., Monhystera paludicola Dm., Theristus setosus B., Ironus tenuicaudatus Dm., their distribution, however, in the bottom sediment of the open water was not uniform. The number of nematodes was greater in the north-east-basin of Lake Balaton (15,000/m2) than in the south-west (10,000/m2). Greater numbers, above 23,000/m2, were generally found near the northern shore. Along the longitudinal axis of the lake a minimum was observable: 5000/m2. Lowest

numbers were recorded for the area of the Bay of Szigliget: 3000/m2. Comparison of the quantitative distribution of nematodes with that of algae living on the surface of bottom shows that in areas where the diatoms were numerous (150,000-200,000/dm2) only few nematodes (below 5000/m2) were found in general. Biomass figures of nematodes varied between 5-10 mg/m2. They were the lowest, only 1-2 mg/m2, in the Bay of Szigliget. Highest values beyond 12 mg/m2 were measured in the Bay of Keszthely and in the central part of the north-east-basin. In the 'kut' at Tihany and the Bay of Fuzfo, different from their surroundings, both the individual number and biomass values of nematodes were great.--Copyright 1973, Biological Abstracts, Inc.
W75-08385

EGGSHELL THINNING, CHLORINATED HYDROCARBONS, AND MERCURY IN INLAND AQUATIC BIRD EGGS, 1969 AND 1970,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
R. A. Faber, and J. J. Hickey.
Pestic Monit J. Vol 7, No 1, p 27-36, 1973, Illus.

Descriptors: *Great Lakes Region, *Bird eggs, Birds, *Water birds, Common merganser duck, Ducks(Wild),DDE, Dieldrin, Mercury, PCB, Pesticides, Insecticides, Pollutants, *Water pollution effects, *Chlorinated hydrocarbon pesticides, Inland waterways.
Identifiers: BHC, Cormorants, Eggs, Grebes, Herons, Mergansers, Eggshells, Fish-eating birds.

In the upper Great Lakes states 9 out of 13 species of fish-eating birds were found in 1969-70 to have sustained statistically significant decreases in eggshell thickness since 1946. Maximum changes in a thickness index occurred in great blue herons (-25%), breasted mergansers (-23%), common mergansers (-15%), and double-crested cormorants (-15%). Heron eggs taken in Louisiana generally displayed a smaller post-46 change than herons in the Middle West. On a lipid basis, mean polychlorinated biphenyl (PCB)- and DDE residue levels exceeded 100 ppm in 7 out of 13 species in the Great Lakes States and in 2 of 7 species in Louisiana, the average DDE:PCB ratios in the 2 regions being 1.25:1 and 3.9:1, respectively. Individual dieldrin values were higher in Louisiana (31.6 and 13.95 ppm in heron species from 2 different locations), although values reached 10.1 and 9.4 ppm in great blue and black-crowned night herons in Wisconsin. BHC (benzene hexachloride) averaged 3.01 and 0.39 ppm in the Lake States and Louisiana, respectively. Of eggs examined for Hg, 29% had levels greater than 0.5 ppm, and 9% greater than 1.0 ppm on a wet-weight basis. Hg levels in a small sample of eggs from Louisiana were consistently low. The differences in Hg levels between the 2 regions were similar to those found for the chlorinated hydrocarbons. While DDE was a prominent factor for most groups, especially herons, in relation to the eggshell thinning observed, dieldrin was also important to 2 groups even though DDE was present in much higher amounts. PCB's were also important to mergansers, while Hg was positively correlated with thickness index in grebes and negatively correlated in mergansers.--Copyright 1974, Biological Abstracts, Inc.
W75-08391

BIOLOGICAL METHODS FOR THE ASSESSMENT OF WATER QUALITY.
For primary bibliographic entry see Field 5A.
W75-08392

ECOLOGY OF THE GREEN KRYOPHILIC ALGAE FROM BELANSKE TATRY MOUNTAINS (CZECHOSLOVAKIA),
Ceskoslovenska Akademie Ved, Trebon. Inst. of Microbiology.
J. Komarek, F. Hindak, and P. Javornicky.

Arch Hydrobiol Supplementb. Vol 41, No 4, p 427-449. 1973, Illus.

Descriptors: Europe, Mountains, *Algae, *Ecology, *Snow cover, Snowpacks, Photosynthesis, Photosynthetic bacteria, *Cold regions, Subarctic.
Identifiers: Green algae, Belanske, Tatry Mts., Carbon-14, Chlamydomonas-Sp, *Kryophilic, Algae, Czechoslovakia, Koliella-tatrae, Tatry Mountains, Biotopes.

The ecology of kryophilic algae of the permanent snowfield (1340 m) was studied in Belanske Tatry Mountains (Tatra National Park, north Slovakia, Czechoslovakia). The main components of the algal community were Koliella tatrae and 1 green species of Chlamydomonas. The vegetation lasted from May to the end of Oct., reaching its maximal development from the end of Aug. to the beginning of Oct. During the entire cycle of vegetation, the temperature was about 0C. The concentrations of main nutrients in the surface snow layer were comparable with eutrophic water reservoirs and were not a limiting factor. K. tatrae seems to be shade adapted, as it follows from its distribution over the snowfield and on its flanks. The field is situated on a rocky gorge, facing NNE and during the whole year it is protected against the direct sunshine. The maximal coloration of snow was found in the noon light intensities (0.2-0.6-(1.0).10-2 cal.cm-2.min-1. The abundance, biomass of algae, chlorophyll-a concentrations and photosynthesis in situ by means of 14CO2 gas chambers are given. The mean chlorophyll content in the shaded snow algal population is low and corresponds with values found for the 'sun phytoplankton' of mesotrophic water bodies. The net photosynthesis in the range (0.04)-0.13-088(1.85)Cass(assimilated) microgram (mm3 of algae)-1.h-1, and photosynthetic activity in the range (0.26)0.9-6.1(12.9) Cass microgram.Cbm (in biomass)mg-1.h-1, were determined. Results are comparable with those given by Fogg (1967) and Thomas (1969) from the similar biotopes. As the entire life cycles of kryophilic algae run close to the lower temperature limit of photosynthesis, they have a special importance for the recognition of photosynthetic potentiality in extremely cold biotopes.--Copyright 1974, Biological Abstracts, , Inc.
W75-08393

CONCENTRATION OF ADENOVIRUS FROM SEAWATER,
New Hampshire Univ., Durham. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W75-08455

ENVIRONMENTAL EFFECTS OF DREDGING AND SPOIL DISPOSAL,
Washington State Dept. of Ecology, Olympia.
G. S. Jeane, II, and R. E. Pine.
Journal Water Pollution Control Federation, Vol 47, No 3, p 553-561, March 1975. 2 fig, 5 tab, 2 ref.

Descriptors: *Dissolved oxygen, *Dredging, *Toxicity, *Fish, Salmon, Water quality, Settling basins, Conductivity, Salinity, Temperature, Environmental effects, Organic matter, Industrial wastes, Breakwaters, Turbidity, Soil engineering, Sands, Bioassay, Waste disposal, Hydraulics, *Washington.
Identifiers: *Everett Harbor(Wash), *Spoil disposal, Ship docking, Berthing areas, Supernatant.

The Washington State Department of Ecology instituted a study of the effects of hydraulic dredging on water quality at the Port of Everett Hewitt Avenue Terminal project in October 1972. In addition to water quality parameters, toxicity to juvenile chinook salmon (O. tshawytscha) was investigated. The settling basin effluent weir had a maximum of 0.21 ppb of mercury, a Pearl-Benson

Index of 41 mg/1, 18% volatile solids, and no detectable sulfides. The in situ bioassay demonstrated no toxicity. Dissolved oxygen was depressed more than 50% in the area of dredging and supernatant return during sludge material removal. The dredging portion of the project was accomplished with a cutter suction-type hydraulic dredge. The dredge had a pumping capability of 25,000 gpm of water containing 15-18% solids. The dredge spoils were transported through a 24-inch floating pipeline to a two-cell settling basin with a 200-foot long effluent weir. The material consisted of sand, organic material, and industrial waste. (Roberts-ISWS)
W75-08465

PHOSPHORUS SOURCES FOR LOWER GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Green Bay. Ecosystems Analysis.
For primary bibliographic entry see Field 5B.
W75-08467

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT-PHASE II,
Washington Cooperative Fishery Unit, Seattle.
For primary bibliographic entry see Field 5B.
W75-08468

THE PHOTOSENSITIZING ACTION OF 2-NAPHTHYLAMINE ON ESCHERICHIA COLI, K-12,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-08476

HYDROGEN SULFIDE EFFECTS ON SELECTED LARVAL AND ADULT MARINE INVERTEBRATES,
Oregon State Univ., Corvallis. Water Resources Research Inst.
R. S. Caldwell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 313, $3.75 in paper copy, $2.25 in microfiche. Completion Report WRRI-31, April 1975. 22 p, 2 fig, 4 tab, 16 ref. OWRT A-020-ORE(1).

Descriptors: Hydrogen sulfide, Invertebrates, Water pollution effects, Crabs, Oysters, Sea water, Lethal limit, Toxicity, Embryonic growth stage, Larvae, Juvenile growth stage.
Identifiers: Marine invertebrates, Dungeness crabs, Pacific oysters, Anoxic conditions.

Six species of marine invertebrates including larval and juvenile Dungeness crab, Cancer magister, and Pacific oyster, Crassostrea gigas, were examined for their tolerance to dissolved hydrogen sulfide in sea-water. In tests lasting up to 4 days, the sulfide tolerances of organisms ranged from a low of 0.2 mg/l for Anisogammarus confervicola to 6.0 mg/l for Macoma balthica. The range of tolerances appeared to correlate with the expected degree of anoxic conditions that would be encountered by each species in its natural habitat. Early embryos of C. gigas were very sensitive to hydrogen sulfide since an exposure to 0.32 mg/l for only 2 h. drastically affected the normal development of this stage. Seven day old veliger larvae of this species were not affected by 2 h. exposures of up to 0.56 mg/l hydrogen sulfide but were inactivated by 1.0 and 3.2 mg/l. However, recovery, even after exposure to the highest concentration, was complete after 24 h. Dungeness crab zoeae exposed for 74 h. to 0.56 mg/l sulfide were less able to tolerate a 15 or 90 min. period of heat shock at 29.0 deg C than were control organisms or those exposed to 0.18 mg/l. However, zoeae exposed for 48 h. to either 0.5 or 1.0 mg/l sulfide survived as well as controls at temperatures of 25.0 - 28.0 deg C. It is suggested that estuarine organisms live very close to their tolerance limits for hydrogen sulfide.

W75-08491

ANALYSES OF SELECTED CONSTITUENTS IN NATIVE WATER AND SOIL IN THE BAYOU BOEUF-CHENE-BLACK AREA NEAR MORGAN CITY, LOUISIANA, INCLUDING A MODIFIED STANDARD ELUTRIATE TEST,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-08501

A COMPARISON OF THE LETHALITY OF VARIOUS COMBINATIONS OF HEAVY METALS AND WATER TEMPERATURE TO JUVENILE RAINBOW TROUT.
Available from the National Technical Information Service, Springfield, Va. 22161, as BNWL SA4704, $4.00 in paper copy, $2.25 in microfiche. (1973), 5 p.

Descriptors: Water pollution, *Mercury, *Bioassay, *Heavy metals, *Rainbow trout, Water temperature, Water quality standards, Baseline studies, Environmental effects, *Toxicity, Water pollution effects, Fish reproduction, Animal growth, Thermal pollution, *Lethal limit.

This research project attempted to define and quantify the combined action of potential chemical pollutants with various water temperatures on fish and fish food organisms. Effects of a toxicant at different water temperatures were compared using the 96 hour TL50 continuous flow bioassay. Also included were studies on the growth and reproduction of the fish and fish food organisms wich survive sublethal pollutant exposures. The pollutants were mercury and chlorine at temperatures of 10C, 15C and 20C. Rainbow trout exhibited a three-fold difference in resistance to both mercury and chlorine depending upon the ambient temperature. Fish at 15C were the most resistant to the pollutant concentrations while either an increase or decrease of temperature from 15C caused a decreased resistance. The chlorine studies were hampered by analytical techniques which would not detect chlorine sufficiently at low levels. (Jernigan-Vanderbilt)
W75-08528

THE DISTRIBUTION OF INTRAPERITONEALLY INJECTED CADMIUM-115M IN CHICKENS,
Purdue Univ., Lafayette Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5A.
W75-08533

EVALUATION OF BACTERIAL PRODUCTION IN A POND IN SOLOGNE, (IN FRENCH),
Centre National pour l'Exploitation des Oceans, Paris (France).
J. Hussenot, and M. Laurent.
Ann Hydrobiol. Vol 4, No 2, p 169-181. 1973, (English summary).

Descriptors: *Bacteria, Ponds, *Analytical techniques, *Water pollution, *Measurement, Statistical methods, Numerical analysis, *Approximation techniques, *Growth rates, Mud, *Reproduction, Benthic fauna, *Algae, Microorganisms, Chara.
Identifiers: Dialysis, Bag, *France(Sologne), Chalk, Characeae, Zaika's formula.

A method for the measurement of bacterial production was developed by means of a bag meant for long incubations, the dialysis bag. The wall of the bag usually used for perfusion studies allows the passage of gas and ions of molecules. The confinement of bacteria during incubation is thus avoided. Bacteria are counted by the suspension-dilution method, using successive 50% dilutions, with 8 tubes for each dilution, which allows enough precision for evaluating the doubling of the

number of germs. After a critical study of the various formulas for the estimation of bacterial production, Zaika's formula was chosen. The adding of chalk to the mud, in an intimate mixture in the laboratory, involves the development of benthic algae, mainly Characeae there was also an increase in the number of ammonifying microorganisms and a decrease in the organic matter content. The adding of chalk to these samples, in which the mud layers are not disturbed, provokes the same phonomena as the intimate mixture and a slight decrease in the mud level. The results observed in the field corroborate those obtained in the laboratory. The CaCO3 seems then to be a stimulating factor in organic matter mineralization.--Copyright 1974, Biological Abstracts,Inc.
W75-08534

FLOW-THROUGH APPARATUS FOR ACUTE TOXICITY BIOASSAYS WITH AQUATIC INVERTEBRATES,
Fisheries and Marine Service, Winnipeg (Manitoba). Aquatic Toxic Studies Div.
For primary bibliographic entry see Field 5A.
W75-08563

GROWTH OF THE BLUE-GREEN ALGA MICROCYSTIS AERUGINOSA UNDER DEFINED CONDITIONS,
Nebraska Univ., Lincoln. Dept. of Chemical Engineering.
S. Goto.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 511, $4.75 in paper copy, $2.25 in microfiche. M Sc Thesis, September 1972, 93 p, 7 fig, 34 tab, 60 ref, 4 append. OWRR A-020-NEB(2), 14-31-0001-3527.

Descriptors: *Eutrophication, Algae, Eutrophication, Lakes, *Cyanophyta, Bacteria, Cultures, Phosphates, Nitrates.
Identifiers: *Microcystis aueriginora.

There has been considerable speculation that eutrophication is aggravated by phosphates and nitrates released from fertilized fields and incompletely treated sewage. This research attempts to determine the limiting factors for growth of the blue-green alga, Microcystis aeruginosa, which causes massive algal blooms in lakes, by growing it in continuous culture under controlled conditions on a synthetic medium. Eventually, this project will evaluate the symbiotic growth of a typical species of bacteria with M. aeruginosa. By monitoring and controlling medium flow rate, feed nutrient concentrations of phosphate and nitrate, light intensity, and air or enriched carbon dioxide flow rate, and by employing two-species as well as one-species culture it is possible to determine the limiting concentrations of each component for the algae or the algae and bacteria. Results from continuous cultures of the alga as well as preliminary work on both the bacteria and algae are reported.
W75-08579

ACID TOLERANCE IN THE BROWN BULLHEAD ICTALURUS NEBOLOSUS (LE SUEUR),
West Virginia Univ., Morgantown. Dept. of Biology.
B. E. Sprague.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 513, $5.25 in paper copy, $2.25 in microfiche. MSC Thesis, 1974, 98 p, 26 fig, 34 tab, 14 ref. OWRT A-017-WV(3).

Descriptors: *Acidic waters, *Bullheads, *Bioassay, *Lethal limit, Hydrogen ion concentration mine wastes, Water pollution sources, Water pollution effects, Acid mine wastes, Freshwater fish, Mortality, Laboratory tests, *West Virginia, Temperature.
Identifiers: *Brown Bullhead, Ictalurus nebulosus, *Monongahela River(WV).

TL50 bioassays were conducted to determine the tolerance of the brown bullhead to minimum pH and maximum acidity in a chemically constituted water simulating the mine acid polluted environment of the Monogahela River. An intermittent flow-through system was used with sulphuric acid as the toxicant. The TL 50 bioassays were classified as a warm water experiment and two cold water experiments because of temperature variation during the research. The 72 hour estimates for the warm water bioassay, mean water temperature 25.9C, were TL 50 values of pH 3.32, hot total acidity 44.8 mg/l (as Ca CO3) and cold total acidity 42.1 mg/l. The 72 hour estimates in the cool water bioassay, mean water temperature 18.5C were based on a combination of treatments in the two experiments. The cool water temperature 72 hour TL 50 values were pH 3.21, hot total acidity 51.7 mg/l and cold total acidity 54.9 mg/l. The toxicity of sulphuric acid appears to be dependent on the hydrogen ion concentration. The apparent cause of the mortality was asphyxiation from coagulation of mucus on the gill filaments. The TL 50 results tend to support the hypothesis that the brown bullhead is one of the most acid tolerant species in the Monongahela River. (Katz)
W75-08581

THE EFFECTS OF POLLUTANTS ON MARINE MICROBIAL PROCESSES: A FIELD STUDY,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
R. Mitchell.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-787 602, $3.75 in paper copy, $2.25 in microfiche. Technical Report No 6, Sept 1974 45 p, 2 fig, 6 tab.

Descriptors: *Water pollution effects, *Mathematical models, *Bacteria, *Coral, Laboratory tests, *Electron microscopy, Lethal limit, Methodology, Oil, Phosphates, Oxygen, Toxins.
Identifiers: *Sub-lethal effects, Mucus, *Microbial processes, Tissue cultures, Beggiota.

Red Sea corals were used as a model for describing the effects of low concentrations of chemical pollutants on microbial processes in seawater. Low concentrations of crude oil, copper, and available organic matter, which were insufficient to kill the corals directly, upset the microbiological balance on the coral surface. Mucus production by the coral was stimulated and bacteria were attracted to the mucus and grew on it. Three factors associated with bacteria growth were responsible for the death of the coral colonies: (1) oxygen depletion; (2) chemical toxins; and (3) bacterial predators, particularly, Beggiota. Described is the development of a mathematical model to stimulate the destruction of corals by bacteria when the corals are under pollution stress. The model will be used to determine feedback between microbial processes involved in coral death. The model will be extended to provide predictive curves of the effect of combinations of low level pollutants on microbial kill of corals and on other microbial processes in the ocean. (Katz)
W75-08583

BIOLOGICAL FEATURES OF INTERTIDAL COMMUNITIES NEAR THE U.S. NAVY SEWAGE OUTFALL, WILSON COVE, SAN CLEMENTE ISLAND, CALIFORNIA,
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-783 029, $4.75 in paper copy, $2.25 in microfiche. Naval Undersea Center, San Diego, California, Report NVC TP396, July 1974, 85 p, 17 tab, 18 fig, 84 ref. Murray, S. N. and Littler, M. M., eds.

Descriptors: *Intertidal areas, *Sewage effluents, *Biological communities, *Benthos, *California, Water pollution sources, Water pollution effects, Algae, Invertebrates, Cyanophyta, Chlorophyta, Stratification, Domestic wastes, Primary productivity, Growth rates.

Identifiers: *San Clemente Island(Calif), Acmaea limatula.

Studies on the effects of a low-volume discharge of raw sewage on rocky marine intertidal communities near Wilson Cove, San Clemente Island, California included taxonomic surveys and quantitative assessments of standing stock, community structure and primary production for the sewage-affected area and nearby unpolluted (control) areas. Additionally, a comparative populational study of the limpet Acmaea limatula revealed that only larger individuals were present in the outfall area. Near the outfall pipe, intertidal communities were characterized by lower species diversity, reduced standing stocks of large, canopy-forming intertidal macrophytes (which largely had been replaced by a low-growing algal turf) and an abundance of suspension-feeding animals. The most productive macrophytes were among those most abundant in the outfall area. Additional manipulative studies revealed that the outfall area consisted of disclimax communities. (Katz)
W75-08585

APPARATUS AND PROCEDURE FOR MEASURING SUBLETHAL TOXICITY OF WASTEWATER DISCHARGES,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
For primary bibliographic entry see Field 5A.
W75-08586

A REVIEW OF THE LITERATURE ON THE USE OF 2,4-D IN FISHERIES,
Southeastern Fish Control Lab., Warm Springs, Ga.
D. P. Schultz, and P. D. Harman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 457, $4.75 in paper copy, $2.25 in microfiche. March 1974. 90 p, 201 ref.

Descriptors: *Reviews, *2,4-D, Publications, *Herbicides, Effects, *Bibliographies, Chlorinated hydrocarbon pesticides, Pesticides, Regulation, *Toxicity, Irrigation canals, Water pollution effects.

The herbicide 2,4-D was adapted from terrestrial to aquatic use. Recommended treatment rates vary from 2.24 kg/ha to 22.4 kg/ha or even higher for submersed species. The most commonly used formulation is the dimethylamine salt of 2,4-D (DMA-2,4-D). The ester formulations are also used, but are 10 to 20 times as toxic to fish and other aquatic organisms as the dimethylamine salt. A tolerance of 0.1 mg/liter has been issued for DMA - 2,4-D that occurs in potable water as a result of applications of DMA - 2,4-D to ditch banks in the western United States. Several federal agencies are presently pursuing the registration of 2,4-D for use in irrigation canal banks and for use in moving water. Most of the research necessary for registration of 2,4-D has been completed. A review is presented of the literature concerning the use of 2,4-D in fisheries. (Katz)
W75-08587

A REVIEW OF THE LITERATURE ON THE USE OF TFM-BAYLUSCIDE IN FISHERIES,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
S. E. Hamilton.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 442, $4.25 in paper copy, $2.25 in microfiche. March 1974. 53 p, 54 ref, 1 tab.

Descriptors: *Reviews, *Publications, *Bibliographies, *Lampreys, *Pest control, *Pesticides, Water pollution effects, Freshwater fish, Fisheries, Bioassay, Toxicity, Testing, Fishes.
Identifiers: *Bayluscide, *Lampricides, *TFM, 3-triflouromethyl-4-nitrophenol.

In a search for a selective larvicide that would control lampreys without destroying fish and other aquatic organisms, about 6,000 chemicals were tested by the U.S. Fish and Wildlife Service, largely during the mid 1950's. One compound, TFM, which is selectively toxic to sea lampreys was developed for field use. In 1963 Bayluscide (R) was discovered to be extremely toxic to sea lampreys. Because Bayluscide is also very toxic to fish, being virtually non-selective between lampreys and rainbow trout, only 3% by weight can be added to TFM without losing the selective toxicity of TFM. Addition of Bayluscide to TFM, however, effects substantial savings by greatly reducing the amount of TFM needed for effective treatment of lamprey populations. A complete review of literature concerning TFM-Bayluscide's use in fisheries is presented. (Katz)
W75-08588

THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN: SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA,
New York Aquarium, Brooklyn. Osborn Labs. of Marine Sciences.
K. Gold.
Available from the National Technical Information Service, Springfield, Va. 22161, as C00 3390 14, $4.00 in paper copy, $2.25 in microfiche. Prepared for the Atomic Energy Commission (1974). 26 p, 15 fig, 13 ref. AEC-AT (11-1)-3390.

Descriptors: *Plankton, *Primary productivity, *Seasonal, *Protozoa, Measurement, *Water temperature, Size, *Growth rates, Population, Water pollution effects, *Food chains, Microorganisms, Environmental effects, *New York.
Identifiers: *Tintinnida.

Tintinnida in local waters were identified throughtout the year to relate species occurrences to water temperature. Maximum number of species was found in the fall; minimum number in the winter. The dimensions of Tintinnida were used for taxonomic purposes and also as an index to physiological processes. Length reflected cell growth and division, and could be used to identify newly divided juveniles and loricae of older generations in the same population. Length of certain species varied according to the temperature during the year: loricae were smaller in warmer waters than at lower temperature, probably due to different rates of fission by the protozoa seasonally. The natural variability of lorica sizes and shapes, much of which is due to environmental factors, was identified for a number of species in the plankton. (Katz)
W75-08589

METHODS FOR ACUTE TOXICITY TESTS WITH FISH, MACROINVERTEBRATES, AND AMPHIBIANS.
National Water Quality Lab., Duluth, Minn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 105, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-009, April 1975. 61 p, 6 tab, 55 ref. EPA Program Element 1BA021.

Descriptors: Water pollution effects, Fish, Amphibians, Methodology, Aquatic animals, Invertebrates, *Bioassay, *Test procedures, *Toxicity, Diseases, Effluents, *Pollutant identification.
Identifiers: *Acute toxicity, Median lethal concentration, Macroinvertebrates, *Toxicity tests.

Four detailed methods for conducting acute toxicity tests with freshwater, estuarine, and marine fish, macroinvertebrates, and amphibians are presented in an integrated format. Nomenclature is consistent with that used in other branches of toxicology. Concepts incorporated into the methods are applicable to toxicity tests with most aquatic organisms. This report was prepared by the Committee on Methods for Toxicity Tests with Aquatic Organisms. (EPA)
W75-08591

ENVIRONMENTAL REQUIREMENTS OF SELECTED ESTUARINE CILIATED PROTOZOA,
New Hampshire Univ., Durham. Dept. of Zoology.
A. C. Borror.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 125, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-74-031, May 1975. 49 p, 14 tab, 62 ref. 18080 FBW.

Descriptors: *Estuarine environment, Protozoa, *Tidal marshes, Distribution, Ecology, Oxygen, Hydrogen sulfide, Salinity, Cycles, Bacteria, Hydrogen ion concentration, Water temperature, *New Hampshire, Water pollution effects, Estuaries.
Identifiers: Tidal cycles, Spartina patens, Spartina alterniflora.

Measurements of temperature, pH, oxygen concentration, H2S concentration, salinity, bacterial concentration, occurrence of micrometazoa, and distribution and abundance of ciliated protozoa were recorded during the summers of 1970 and 1971 in a tidal marsh at Adams Pt., Durham, New Hampshire. Numerous differences in ciliate distribution occurred between the upper (Spartina patens) marsh and the lower (Spartina alterniflora) marsh. Physical and biological parameters of a patens-panne pond were measured during a 2-week period involving the initial flushing of the pool by a session of full moon spring tides. Effects of a full moon spring tide cycle, a neap tide cycle, and a new moon spring tide cycle for one station in the lower marsh were evaluated. During 1970 and 1971, 103 species of ciliates, representing 41 families and 10 orders were identified, including 4 new species. Several instances of correlations between ciliate abundance and oxygen concentration, H2S concentration, and salinity were observed. Contribution of tidal marsh ciliates in general to estuarine food webs probably occurs through their association with particulate detritus. (EPA)
W75-08592

PLUTONIUM AND OTHER TRANSURANIUM ELEMENTS: SOURCES, ENVIRONMENTAL DISTRIBUTION AND BIOMEDICAL EFFECTS.
Atomic Energy Commission, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as Rept No WASH-1359, $10.60 in paper copy, $2.25 in microfiche. Rept. No WASH-1359, Dec 1974. p 332, 48 fig, 36 tab, 247 ref.

Descriptors: *Plutonium, *Uranium, *Energy, *Energy transfer, Assessment, Environment, Distribution, Radioactivity effects, Public health, Safety, Evaluation, Biology, Biodegradation, Biological control, Standards, Administration, Governments.
Identifiers: *Transuranium elements.

This material was prepared at the request of the Division of Biomedical and Environmental Research, U.S. Atomic Energy Commission, in response to a notice appearing in the Federal Register, October 24, 1974. This notice stated the intent of the U. S. Environmental Protection Agency to hold public hearings to evaluate the environmental impact of plutonium and the other transuranium elements and to consider whether new guidelines or standards are needed to assure adequate protection of the general ambient environment and of the public health from potential contamination of the environment by radionuclides of these elements. This report is a compilation of Testimony presented before an EPA hearing board, December 10-11, 1974, Washington, D.C. (Houser-ORNL)
W75-08640

DEMOLITION OF BUILDING 12, AN OLD PLU-TONIUM FILTER FACILITY,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5E.
W75-08643

STUDIES OF PLUTONIUM, AMERICIUM, AND URANIUM IN ENVIRONMENTAL MATRICES,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W75-08646

ANALYSIS OF POPULATION, BIRTH, AND DEATH STATISTICS IN THE COUNTIES SURROUNDING THE BIG ROCK POINT NUCLEAR POWER STATION, CHARLEVOIX COUNTY, MICHIGAN,
Argonne National Lab., Ill.
D. Grahn.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No ANL-8149, $4.00 in paper copy, $2.25 in microfiche. Rept No ANL-8149, January 1975. 35 p, 5 fig, 5 tab, 7 ref.

Descriptors: *Monitoring, *Nuclear powerplants, *Effluents, *Environmental effects, Public health, *Mortality, Toxins, Water pollution, Statistics, Census, Population, Radioactivity, Data collections, Surveys, Data processing, *Michigan.

Allegations that changes in the frequency of infant mortality, cancer mortality, and immature births might be associated with releases of radioactive gases from the 75 MWe nuclear power station at Big Rock Point, Charlevoix, Michigan, are evaluated. Examined are the level of radiation exposures attributable to the station, the demographic and vital statistics of Charlevoix County and seven additional surrounding counties, and the implications of the allegations in view of existing knowledge of radiation effects. The allegations are not supported by this conjoint analysis of population and vital statistics. (Houser-ORNL)
W75-08653

REACTOR SAFETY STUDY - AN ASSESSMENT OF ACCIDENT RISKS IN U.S. COMMERCIAL NUCLEAR POWER PLANTS. APPENDIX VII - RELEASE OF RADIOACTIVITY IN REACTOR ACCIDENTS (DRAFT),
Battelle Columbus Labs., Ohio.
R. L. Ritzman, P. C. Owzarski, A. K. Postma, D. L. Lessor, and D. L. Morrison.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No WASH-1400, $7.60 in paper copy, $2.25 in microfiche. Rept No WASH-1400, August 1974. 67 p, 6 fig, 15 tab, 44 ref, 11 append.

Descriptors: *Nuclear powerplants, *Safety, *Assessment, *Radioactivity, Research and development, Atmospheric pollution, Methodology, Environmental effects.
Identifiers: *Reactor safety, *Reactor accidents, *Containment boundary, *Fission products, Containment, Boiling water reactor, Pressurized water reactor.

Results are described of the Fission Product Source Term Task which has been conducted as part of the U.S. Atomic Energy Commission's Reactor Safety Study. The objective of the Reactor Safety Study is the evaluation of postulated accidents in large water-cooled power reactors with respect to the probability of occurrence and the magnitude of resulting consequences. The primary purpose of the Fission Product Source Term Task has been to specify the size of the fission product source which would escape the containment boundary as a function of time for various accident conditions defined by the Reactor Safety Study. A dominant portion of the effort on the task concerned fission product behavior under reactor core meltdown conditions. The Reactor Core Meltdown

Task provided data on physical events and conditions that were essential in developing the definitions and procedures used to specify fission product movement within and loss from the containment boundary. The methodology that was evolved to enable the performance of calculations of fission product escape to the atmosphere for various accident sequences in a large pressurized water reactor or boiling water reactor is presented. (Houser-ORNL)
W75-08655

NUCLEAR CHEMICAL COPPER MINING AND REFINING: RADIOLOGICAL CONSIDERATIONS,
California Univ., Livermore. Lawrence Livermore Lab.
H. A. Tewes, H. B. Levy, and L. L. Schwartz.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No UCRL-51345 Rev 1, $4.00 in paper copy, $2.25 in microfiche. Rept No UCRL-51345, Rev 1, June 3, 1974. 37 p, 4 fig, 13 tab, 24 ref, append.

Descriptors: *Mining, Copper, *Chemical reaction, *Nuclear energy, *Safety, *Evaluation, Assessment, Hazards, Safety factors, Public health, Environmental effects, Standards, Path of pollutants, Air pollution, Water pollution.
Identifiers: Nuclear chemical, *Copper mining.

A preliminary radiological safety analysis of the proposed nuclear chemical mining and refining process for copper has been carried out. Exposure sources and paths, exposed populations, and dose levels are discussed. Existing data were utilized in the formulation of the safety analysis, and conservative (i.e., 'worst case') assumptions were used where data were unavailable. Despite the 'upper limit' formulation of hypothetical radiological exposures to members of the public, all such exposures were found to be far below (much less than 1% of) current radiation protection guides. (Houser-ORNL)
W75-08662

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT, ECOLOGY, JANUARY - DECEMBER 1973.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W75-08670

THE CONFIGURATION OF THE HYDROCHEMICAL RELATIONSHIPS IN THE HUNGARIAN SECTION OF THE DANUBE DURING THE YEAR 1971: DANUBIALIA HUNGARICA LXVI, (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest (Hungary). Station for Danube Research.
For primary bibliographic entry see Field 5B.
W75-08680

THE EFFECTS OF DOMESTIC AND INDUSTRIAL EFFLUENTS ON A LARGE TURBULENT RIVER,
Alberta Univ., Edmonton. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W75-08709

DREDGED SPOIL DISPOSAL ON THE NEW JERSEY WETLANDS: THE PROBLEM OF ENVIRONMENTAL IMPACT ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N.J. Marine Science Center.
N. P. Psuty, K. F. Nordstrom, R. W. Hastings, and S. Bonsall.
Shore and Beach, Vol 42, No 1, p 25-30, April 1974. 3 fig, 4 ref.

Descriptors: *Dredging, *Spoil banks, *Environmental effects, Shoals, Bays, Lagoons, *Wetlands, Shellfish, Environmental control,

Navigable waters, Channels, Depth, Maintenance, Economic feasibility, Disposal, *New Jersey, Cost-benefit ratio.
Identifiers: *Environmental impact, Intercoastal waterways, *Inland water route.

The problems of maintenance dredging in a 177 mile section of the New Jersey Intracoastal Waterway from Manasquan River to Delaware Bay via the Cape May Canal were discussed. The waterway had been used mainly by pleasure crafts and commercial and sport fishing vessels. Previous dredging had been done with little attention to environmental impacts. Expediency had determined the location of dredge spoil disposal sites. The basic question was whether dredging should be continued in this waterway. Boat operators wanted dredging continued; but environmentalists and others were concerned with protecting the wetlands, shellfish areas, and fish habitats from misuse. It was concluded that the continuation of maintenance dredging could not be accomplished without some environmental destruction. The alternatives to dredge disposal on the marsh included creation of tidal marshlands, development of shoals for shellfish, beach nourishment, and an improvement of the sandy soils of the adjacent coastal uplands. Several studies were recommended to gather environmental data that is required for formation of a new cost-benefit ratio. (Roberts-ISWS)
W75-08716

THE CASCADE TYPE OF DAM RESERVOIRS AND THE EUTROPHICATION,
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
S. Wrobel, and M. Bombowna.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 19-25. 3 fig, 1 ref.

Descriptors: *Dams, *Reservoirs, *Eutrophication, Water quality, Rivers, Primary productivity, Chlorophyll, Phytoplankton, Zooplankton, Benthic fauna, Watersheds(Basins), Detention reservoirs, Electric power, Thermal properties.
Identifiers: Cascade reservoirs(Poland), Sola River(Poland).

As dam reservoirs serve many purposes it is necessary to investigate the influence of the cascade type of dam reservoirs on eutrophication of the water bodies situated below them as well as the quality of water in the rivers below the dams. This problem was considered in relation to the dam reservoirs on the Carpathian rivers. The investigations were carried out during two years, at least three times in a season. Besides the primary production and chlorophyll content, the analyses of phyto- and zooplankton as well as of the bottom fauna were carried out. The chlorophyll was determined spectrophotometrically in an acetone extract from the filtrate obtained on membrane filters and the primary production by using light and dark bottles. The influence of reservoirs on a river is many sided and depends on many factors. The size and depth of the reservoir, the ratio of the volume of the reservoir to the mean yield of rivers, the depth of flood-gates in the dams, the management of the catchment basins of the rivers, the degree of their pollution and the state of banks all play a role. (Jones-Wisconsin)
W75-08764

CHEMICAL AND BIOLOGICAL INDICES OF EUTROPHICATION OF THE LUBACHOW RESERVOIR,
Panstwowy Instytut Hydrologiozno-Meteorologiczny, Wroclaw (Poland).
H. Florczyk, S. Golowin, and A. Solski.

In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 26-30.

Descriptors: *Chemical properties, *Biological properties, *Eutrophication, Reservoirs, Physical properties, Seasonal, Phosphorus, Nitrogen, Water pollution effects, Diatoms, Algae, Water pollution control, Bottom sediments, Bacteria, Indicators.
Identifiers: *Lubachow Reservoir(Poland).

Detailed physical, chemical and biological examinations of the Lubachow Reservoir on the Bystrzyca River, Poland were performed to estimate the degree of eutrophication and the possibility of retarding this process. Thirty investigations were made in one year, enabling the observation of seasonal changes in some chemical components of the reservoir water, especially phosphorus and nitrogen. It was calculated that about 66% of total phosphorus originated from sewage and thus elimination of phosphorus in sewage would decrease the phosphorus load to 3.4 g P/sq m/yr. The factor actually deciding the plankton growth in the reservoir is phosphorus, although its influence can be altered after improving sewage disposal in the catchment area. Moreover it has been calculated that about 60% of the total phosphorus inflow to the reservoir is sinking to the bottom. Characteristic of the reservoir is the occurrence of two phytoplankton maxima. The quantitative growth of plankton reached its maximum in spring and summer, when successive 'blooms' were observed, caused by growth of Asterionella formosa and subsequently by the Cyanodictyon reticulatum and Microcystis aeruginosa. The observed blooms and the evaluation of plankton by means of the modified Nygard's coefficient classify the waters as medium to strongly eutrophic. (Jones-Wisconsin)
W75-08765

EUTROPHICATION OF BAIKAL LAKE,
O. M. Kozhova.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 40-40d.

Descriptors: *Eutrophication, *Lakes, *Water pollution effects, Biological communities, Reservoirs, Rivers, Water levels, Industrial wastes, Biomass, Bottom sediments.
Identifiers: *Lake Baikal(USSR), Angara River(USSR), Irkutsk Reservoir(USSR), Bratsk Reservoir(USSR).

Lake Baikal in the Soviety Union, classified as ultraoligotrophic in a lightly populated area, is being subjected to eutrophication. The main factors changing its highly endemic biological communities are rise of water level due to the Irkutsk hydroelectric dam and inflow of industrial sewage which has doubled the zoobenthos biomass. Bottom communities were polluted with lignin and cellulose. Here the zoobenthic biomass decreased ten times at 5-10 m, three or five times at 20-100 m. Groups of zoobenthos changed considerably. On heavily polluted grounds the community of Mullusca-Oligochaeta became a Gammaridae community. Adjoining sewage outfalls there was a decrease of biomass. At zones removed from sewage outfall, biomass increased and eutrophication intensitifed the biological processes. After building the Irkutsk dam, eutrophication was found, especially near the dam, with the presence of Arsterionella formosa, Daphnia longispina and Bosmina longirostris. Formation of Irkutsk reservoir led to bottom fauna changes. In transformation of Bratsk reservoir, considerable eutrophication took place. In the summer-autumn period a

water bloom was due to Aphanizomenon flosaquae, Anabaena, Ceratium hirundinella. Bacterioplankton increased. Cladocera and Copepoda prevailed instead of Rotaroria. The profundal of the upper part of the Bratsk reservoir is characterized by bottom deposits of suspended materials from industrial and agrarian sewages. (Jones-Wisconsin)
W75-08766

RELATIONS BETWEEN NUTRIENT BUDGET AND PRODUCTIVITY IN PONDS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
J. Hrbacek.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 59-62. 5 ref.

Descriptors: *Cycling nutrients, *Ponds, *Productivity, Eutrophication, Fertilization, Fish farming, Phosphorus, Nitrogen, Bottom sediments, Energy transfer, Equilibrium, Fluctuations, Ammonia.
Identifiers: Blatna(Czechoslovakia), Nutrient budget.

The study of eutrophication could profit considerably if the knowledge of the effects and the mechanism of intentional fertilization were compiled. Data are reported from fishponds west of the town of Blatna, Czechoslovakia. The ponds were fertilized with superphosphate and pig manure. The average amount of total dissolved and dispersed phosphorus was 0.16 mg/l P, which is less than a fifth of the phosphorus applied yearly to the ponds by superphosphate. The maximum values found were only slightly above one third of the amount of phosphorus applied. The average amount of total dissolved and dispersed nitrogen was 1.4 mg/l N; this is more than twice the amount added to the pond in manure. The fish production showed fairly good correlations with the seasonal mean of the total nitrogen in ponds and poorer correlation with total phosphorus. There were low values in total nitrogen in April and May and high values from June through September, with the highest value in August. In phosphate and total phosphorus, values higher than the yearly means were found only in April and May and in phosphate phosphorus also in September. (Jones-Wisconsin)
W75-08767

CHEMICAL AND BIOLOGICAL ASPECTS OF THE EUTROPHICATION OF A TROUT BROOK,
Brno Univ. (Czechoslovakia). Hydrobiologicka Laborator.
F. Kubicek.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 80-83. 7 ref.

Descriptors: *Chemical properties, *Biological properties, *Eutrophication, *Streams, Water pollution sources, Water pollution effects, Municipal wastes, Bioindicators, Agriculture, Oxygen sag, Self-purification.
Identifiers: Trout streams, Czechoslovakia.

A trout brook which receives a waste water load from a community of 2,500 inhabitants in its upper reach was studied. Pollution sources are untreated slope waters from household and public facilities, going directly into the stream. Most houses are provided with privy pits. A periodic pollution source is runoff from fertilized fields. The character of the brook changes markedly after several hundred meters and in station 2 there are

clearly different chemical and biological indices. Oxygen conditions improve especially and clean water fauna are more numerous. Periphyton consists mainly of diatoms. In the microbenthos Ciliata are still dominant. The third section assumes the character of a natural trout brook. Quantity of nutrients is higher than that found in other trout brooks, but the biological composition of the bottom is characterized by a wide range of diatom species, by the occurrence of filamentous algae and by more clean water animal species othan other groups. The proportion of Ciliata in the microbenthos is much lower than in preceding station. Length of the zone with its decisive phase of self-purification and change in nutrient contents depends on conditions. (Jones-Wisconsin)
W75-08768

ON ENVIRONMENTAL FACTORS AFFECTING THE PRIMARY PRODUCTION IN SHALLOW WATER BODIES,
Deutsche Akademie der Wissenschaften zu Berlin (East Germany). Institut fuer Meereskunde.
G. Schellenberger.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 89-91.

Descriptors: *Primary productivity, *Shallow water, *Mathematical models, Estuaries, Radiation, Photosynthesis, Biomass, Phytoplankton, Detritus, Seston, Light intensity.

In developing mathematical models of estuarine ecosystems, it is necessary to elaborate models of the involved subsystems. An important one deals with representation of primary productivity. Gross production rate per unit volume at depth z depends on such environmental properties as light field in the water, temperature, and nutrients. A preliminary model has been constructed under the assumption that nutrients are not lacking and water temperature does not change. In this case the photosynthesis depends only on biomass primary producers and light conditions. Since the water bodies are relatively shallow and well mixed, phytoplankton is homogenously distributed throughout the whole basin. The attenuation coefficient of natural water is the sum of its components (pure water, dissolved organic substances, particles). Particles, especially effective optically, are phytoplankton and detritus. Although a linear relationship is assumed between production rate per unit volume and phytoplankton biomass, the total production rate per unit column -- depending on the ratio of phytoplankton to seston -- seems hardly affected by the total amount of phytoplankton biomass. Considering a production inhibition at high light intensities, total production rate can be favorably influenced by a certain content of dead suspended matter, protecting bioseston against excess light. (Jones-Wisconsin)
W75-08769

LIMNOLOGICAL MODELS OF RESERVOIR ECOSYSTEM,
Ceskoslovenska Adademie Ved, Prague. Hydrobiologicka Laborator.
M. Straskraba.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, sponsored by the Hydrobiological Section of the Biological Society of DDR and the Hydrology Section of the Technical University of Dresden, p 110-110d.

Descriptors: *Mathematical models, *Reservoirs, *Eutrophication, Analytical techniques, Statistical methods, Stratification, Phytoplankton, Productivity, Mixing, Depth, Nutrients, Reservoir storage.
Identifiers: Empirical models, Czechoslovakia.

Two kinds of limnological models are of particular interest relative to eutrophication--empirical and analytical. Empirical models are derived by statistical techniques from direct measurements of dependent and corresponding independent variables. Analytical models, expressed as sets of differential equations, are based on combinations of general quantitative expressions of basic relationships among dominating variables. Particular values for individual water bodies (parameters of the model) are derived either from direct observations or from literary data. For prediction of new conditions, e.g., prediting the effect of the given nutrient supply into an existing water body or predicting water quality in a new reservoir, both approaches have their limitations. A major drawback of the empirical models is the limitation of the validity, for particular sets of conditions, from which they were derived. The analytical models are up to now severely limited by implying constant structure, behavior, and parameters of the system during major changes of trophic status. Two approaches are followed for minimizing drawbacks of both models: empirically determining the relationships of the parameters of analytical models to environmental variables; treating model structure and parameters as a function of major controlling variables. (Jones-Wisconsin)
W75-08770

DRAWING OFF OF HYPOLIMNION WATERS AS A METHOD FOR IMPROVING THE QUALITY OF LAKE WATERS,
P. Olszewski, and A. Sikorowa.
In: International Symposium on Eutrophication and Water Pollution Control, October 16-20, 1973, Castle Reinhardsbrunn, DDR, Sponsored by the Hydrobiological Section of the Society of DDR and the Hydrology Section of the Technical University of Dresdon, p 136-141, 1 tab.

Descriptors: *Hypolimnion, *Oxygenation, *Water treatment, *Lakes, Thermal properties, Chemical properties, Biological properties, Thermal stratification, Bottom sediments, Epilimnion, Thermocline, Primary productivity, Zooplankton, Microorganisms, Bacteria, Benthic fauna.
Identifiers: *Lake Kortowe(Poland).

The thermal, chemical and biological phenomena of Lake Kortowe, Poland resulting from the withdrawal of hypolimnetic waters is presented. The lake has two depressions considerably removed from one another, a southern and a northern 'control,' divided by a shoal with an average depth of 6 m. As a result of pumping from the hypolimnion in the experimental part of the lake, the number of oxygen-free days over the bottom averaged 97 per year, and 124 in the control for 16 years. Hypolimnetic withdrawal in the southern part was begun in 1956. Drawing off the deeper waters was usually begun about May and June, and as a result differences were noted in the two parts of the lake: the epilimnion in the experimental part increased, the thermocline deepened, and autumnal circulation began on an average four weeks earlier and at higher temperatures compared with the control part. An enormous growth in zooplankton numbers was noted. Microorganisms occurred in greater numbers at both sites under study during the summer stagnation period in 1966 and 1967 at a depth of 0.3 to 1 m, in the thermal transition layer, and at the bottom. (Jones-Wisconsin)
W75-08771

DISTURBANCE OF WATER SUPPLY DUE TO SECONDARY BIOLOGICAL CONTAMINANTS, (IN RUSSIA),
Institutul de Sanatate Publica si Cercetare Medicale, Iasi (Rumania).
G. Zamfir, and S. Apostol.
Gig Sanit. 38(9): 73-75. 1973.

Descriptors: *Water quality control, *Water pollution sources, *Water pollution effects, Microor-

ganisms, Bacteria, Fungi, Algae, Benthos, Benthic fauna, Benthic flora, Potable water, Industrial water, *Water supply, Water treatment.
Identifiers: Chlorination, Contaminants, Corrosives.

The effect of secondary biological contaminants (bacteria, fungi, algae, macrophytes, protoza worms, mollusks, crustaceans, insects, fish, etc.) which can increase in number and affect the hygienic and organoleptic properties of water, plug pipes, filters, and pumps and in general make the water unfit for drinking and industrial purposes are discussed. The measures used for controlling contamination (chlorination, ozonation, anti-corrosion coatings, ultrasound, UV and ionizing irradiations, algicides, fungicides, herbicides, insecticides, etc), should be used very judiciously, since all these organisms are also active participants in water self-purification processes. Copyright 1975, Biological Abstracts, Inc.
W75-08773

SWIMMING PERFORMANCE OF ARCTIC GRAYLING,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W75-08788

PRIMARY PRODUCTION IN A GREAT PLAINS RESERVOIR,
G. R. Marzolf, and J. A. Osborne.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 126-133, 1972. 1 fig, 4 tab, 15 ref. OWRR A-032-KAN(2). NSF GB 4560.

Descriptors: *Primary productivity, *Reservoirs, *Great Plains, Oligotrophy, Photosynthesis, Physicochemical properties, *Kansas, Shallow water, Wind, Chlorophyll, Light penetration, Turbidity, Lake morphology, Eutrophication.
Identifiers: *Tuttle Creek Reservoir(Kans).

The investigation of the photosynthetic production of Tuttle Creek Reservoir, Kansas, was motivated predominantly to understand the dynamics of higher trophic levels in this ecosystem. The reservoir is a result of the damming of the Big Blue River 16 kilometers upstream from its confluence with the Kansas River. The features which combine to make this reservoir intriguing are its relatively shallow water and long fetch to winds which constitue a major feature of the prairie environment. It is very likely that the annual mean rate of primary production is light limited in Tuttle Creek Reservoir. It is not clear that seasonal variation under that limitation is totally energy dependent. There are instances when the production rate is not commensurate with chlorophyll concentration. The correlation of primary production with the light extinction coefficient is not sufficiently suggestive to stimulate a search for casusality though cause and effect cannot be denied. It is concluded that primary production is light limited and that the mechanisms of the limitation are likely to be related to the morphology of the basin and to wind which serves to maintain turbid conditions and to limit the time available for photosynthesis by vertical mixing. (Jones-Wisconsin)
W75-08846

5D. Waste Treatment Processes

FORMATION OF HALOGENATED ORGANICS BY CHLORINATION OF WATER SUPPLIES,
Harvard Univ., Cambridge, Mass. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5F.
W75-08357

FACTORS AFFECTING COLOR DEVELOPMENT DURING TREATMENT OF TNT WASTE,
Air Force Academy, Colo.
M. W. Nay, Jr, C. W. Randall, and P. H. King.

Paper presented at the 27th Annual Purdue Industrial Waste Conference, Purdue University, Lafayette, Indiana, May 2-4, 1972. 8 p, 5 tab, 7 fig, 8 ref.

Descriptors: *Explosives, *Waste water treatment, *Industrial wastes, *Color reactions, *Lime, *Colorimetry, Spectrophotometry, Light, Activated carbon, Temperature, Ambient light, Temperature control, Organic wastes, Waste treatment, Organic compounds.
Identifiers: *Trinitrotoluene(TNT), Color removal, Nitroaromatic compounds.

Experiments have demonstrated that color development in TNT waste does occur as the pH increases and that the developed color has a derogatory effect on subsequent waste treatment, both biological and physical-chemical. The color development during pH adjustment is a function of the light intensity, temperature, type of neutralizing agent, chemical dosage and the time since chemical adjustment. Obviously, if the waste is to be treated biologically or discharged to a biological system, the pH must be adjusted first. The first color development experiment consisted of raising the pH of the raw TNT waste to selected values with both neutralizing agents and observing the immediate color development. Typical results show that lime contributes to a greater immediate increase in color than does soda ash at all pH values. Experimental results have shown that a photochemical enhancement of color development does occur and temperature also affects color development. Excessive dosages of neutralizing agents can increase color development. The prevention of color development, rather than the removal of developed color is emphasized. Neutralization facilities should be designed to eliminate sunlight, to provide a stable pH, to permit cooling of the waste before chemical adjustment and to avoid overdose situations. (Poertner)
W75-08362

REMOVAL OF 2,4-D AND OTHER PRESISTENT ORGANIC MOLECULES FROM WATER SUPPLIES BY REVERSE OSMOSIS,
Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.
V. H. Edwards, and P. F. Schubert.
Journal of the American Water Works Association, Vol 66, No 10, p 610-614, October 1974. 1 tab, 28 ref. OWRR A-032-NY(2).

Descriptors: *Reverse osmosis, *Water quality control, *Experiments, *Water chemistry, Water analysis, Pesticides, Waste treatment, Adsorption, Aqueous solutions, Water reuse, *Waste water treatment.
Identifiers: *Organic chemicals, Water purification.

Reverse osmosis is still one of the most promising techniques for removal of many refractory organics of intermediate to high molecular weight from water, and reuse of recovered byproducts is simpler than with carbon adsorption. Presented is a review of the ways in which these techniques are used. First, recalcitrant organic chemicals, reverse osmosis for waste treatment and water purification, and pesticide analysis are discussed. Next, the following experimental methods and their results are discussed: reverse osmosis experiments; adsorption experiments; 2,4 dichlorophenoxyacetic acid (2,4-D) analysis; preparation of cellulose triacetate membranes; and preparation of iron-complex 2,4-D derivative. Considered also are aqueous solutions of a single organic, anionic polyelectrolyte complexes, and aqueous mixtures of several organics. Reverse osmosis shows varying selectivity for pesticide residues depending on the residue, residue concentration, membrane, and the presence of other solutes. Reverse osmosis membranes remove bacteria and viruses quantitatively in the absence of membrane defects. (Bell-Cornell)
W75-08365

WATER VOL. 39. A YEARBOOK FOR HYDROCHEMISTRY AND WATER PURIFICATION TECHNIQUE,
For primary bibliographic entry see Field 5F.
W75-08390

ALGAE REMOVAL BY UPFLOW FILTRATION,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
J. H. Forbes, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 369, $4.75 in paper copy, $2.25 in microfiche. M S Thesis, December 1974. 86 p, 19 fig, 3 tab, 38 ref. 3 append. OWRT A-027-NEB(7). 14-31-0001-5027.

Descriptors: *Algae, *Oxidation ponds, *Suspended solids, *Filtration, *Waste water treatment, Design criteria, Operations.
Identifiers: *Algae removal, Upflow filtration.

Upflow filtration of oxidation ponds has shown promise of being an effective and economical method of removing suspended solids. This preliminary investigation determined some design and operating criteria which should be incorporated in a further study. Some conclusions found: (1) suspended solids removals of 50% are obtainable on influents in the 110 mg/l range; (2) the upflow unit provided an average 40% BOD and 16% COD reduction; (3) effluent was always of higher quality than the influent with maximum removals occurring during the first hour; (4) the minimum backwash time is five minutes; (5) filamentous algae are consistently removed while smaller algae pass through indicating expansion controls should be initiated; and (6) upflow filtration shows promise of being an effective and economical means of algae removal from oxidation ponds.
W75-08474

EFFECT OF HOLDING TIME ON RETENTION POND EFFLUENT,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
L. A. Schmid, and K. W. Mueldener.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 351, $4.25 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution Number 162, April 1975. 67 p, 22 tab, 10 fig, append. OWRT A-057-KAN(1). 14-31-0001-3816.

Descriptors: Water quality, *Retention, Settling basins, Effluents, *Waste water treatment, *Tertiary treatment, Lagoons, Sewage treatment, Copper.
Identifiers: *Polishing ponds, Algae control, Flow equalization.

Polishing ponds are often required following extended aeration activated sludge sewage treatment. These polishing ponds are installed to further treat the secondary effluent by sedimentation and flow equalization. The quiescent pond conditions combined with the readily available nutrients in the secondary effluent often results in profuse algal blooms which can result in a lowering of the overall water quality through the pond. Two polishing ponds were monitored for one year to evaluate their effectiveness. One pond, with a detention time of 10 days, received a well treated secondary effluent. This pond lowered the water quality in the summer, while improving it in the winter. For the entire year on an average, there was no water quality improvement through the pond. Sludge build-up was not a problem in this 10 day pond. Coliform reduction was poor through the pond. Copper was effective as an algicide from 0.3 to 1 mg/l. Copper residuals were detected for several weeks indicating little precipitation of copper as copper carbonate. The second polishing pond folowed an inefficient treatment plant. This

pond, detention time of 4 days, provided emergency treatment that would not have been available without the pond. The pond reduced, BOD5, COD, and suspended solids by about 50 percent. It was concluded that polishing ponds serve a useful purpose simply by providing emergency treatment during periods of plant upset.
W75-08487

WATER REUSE: RESOURCE OF THE FUTURE,
Dallas Water Utilities Dept., Tex.
H. J. Graeser.
American Water Works Association Journal, Vol 66, No 10, p 575-578, October, 1974. 1 fig.

Descriptors: *Water reuse, *Water resources, *Waste water treatment, *Water treatment, Viruses, Public health, Chemical precipitation, Organic compounds, Pesticides, Nitrification, Heavy metals.

This paper presented the opinion that water reuse may soon be the only alternative available to the water-supply industry if it is to maintain its present supply of water resources. The author noted that American wastefulness is putting an increasing burden on our streams. A recent Gallup poll indicated that the concept of water reuse is acquiring more acceptability. The author also presented brief descriptions of three areas of investigation in water reuse by the Dallas Reclamation Research Center. Alum treatment at doses three to four times greater than those required for clarification with filtration can produce an effluent that can be successfully disinfected for virus. Activated carbon filtration was found to be most effective in removing potentially dangerous organics, such as pesticides. In addition, when the activated sludge process was operated in a nitrifying mode, effluent organics were markedly reduced and heavy metals removal also apparently increased. The removal of heavy metals by carbon adsorption decreased very markedly as the effluent ammonia concentration increased. The researchers found the most difficult metals to remove are lead, cadmium and barium. (Pulliam-Vanderbilt)
W75-08537

FEEDING CATTLE AT THE PULP MILL,
Tampella A.B., Tampere (Finland).
H. Romantschuk.
Unasylva, Vol 26, No 106, p 15-17, Autumn, 1974. 2 fig, 1 tab.

Descriptors: *Sulfite liquors, *Proteins, *Fermentation, *Pulp wastes, Industrial wastes, Wastes, Fungi, Foreign research, Foreign countries, Europe, Water pollution sources, Feeds, Water pollution control, Waste water treatment, Cattle, *Recycling.
Identifiers: *Pekilo process, Pekilo protein, Finland.

A brief description is given of the 'Pekilo' process, development in Finland, for converting the spent liquor of a sulfite pulp mill into single-cell protein through fermentation by fungi. The process is also applicable to other carbohydrate-containing wastes. Animal feeding tests showed that Pekilo protein can be used as a partial substitute for soybean meal, fish meal, or skim milk powder. United Paper Mills Ltd. is building a Pekilo plant with a capacity of 10,000 tons annually at its Jamsankoski (Finland) pulp mill. The advantages of the Pekilo process over other carbohydrate fermentation processes are given. (Witt-IPC)
W75-08539

PURIFICATION OF WASTEWATERS AND GASEOUS EMISSIONS IN THE U.S.A. (OCHISTKA STOCHNYKH VOD I GAZOVYKH VYBROSOV NA PREDPRIYATIYAKH S.SH.A.),
Ministerstvo Bumazhnoi i Derevoobrabatyvayushchei Promyshlennost, Moscow (USSR).

A. M. Pristupa.
Bumazhnaya Promyshlennost, No 12, p 23-26, December, 1974. 4 fig, 1 tab.

Descriptors: *Water pollution control, *Air pollution, *Pulp and paper industry, *United States, Research and development, Chemicals, Ozone, Chlorine, Sludge, Economics, Wastes, Industrial wastes, Water pollution sources, Water pollution control, Effluents, Waste water treatment, Organizations, Bleaching wastes, Pulp wastes, Foreign countries.
Identifiers: USSR(Soviet Union).

Within the frame of the USSR-U.S.A. agreement on cooperation in the area of environment protection, a group of Soviet specialists visited several U.S. mills and paper industry organizations to learn about water and air pollution control. This report on the visit discusses recent progress in pollution control, describes control measures at individual mills, and reviews research conducted in this field. Increased attention is paid to the use of bleaching agents other than chlorine (e.g., ozone) and to the economical utilization of sediments from effluent purification. (Stapinski-IPC)
W75-08540

SIMPLE AERATOR SOLVES PROBLEMS.
Processing, Vol 21, No 1, p 6-7, January, 1975. 2 fig.

Descriptors: *Aeration, *Equipment, *Treatment facilities, Sewage treatment, Oxygenation, Water purification, Water quality control, Industrial wastes, *Waste water treatment.
Identifiers: *Helixor aerator.

The Helixor aeration device, developed by Polcon Corporation of Canada, consists of a rigid polyethylene pipe (18 inches in diameter) incorporating an internal helix element. The Helixor is anchored in vertical position on the bottom of a tank, basin, lagoon, or the like, and air is supplied at the base of the unit on either side of the helix component by means of a plastic tube. The air bubbles generated create an upward draft which carries water into and up through the pipe, creating good circulation and providing maximum oxygen transfer. Possible applications of the Helixor for treating industrial wastes are indicated. (Witt-IPC)
W75-08542

ABILITY OF LIGNIN TO BIND IONS OF CERTAIN HEAVY METALS (ISSLEDOVANIE SPOSOBNOSTI LIGNINA SBYAZYVAT' IONY NEKOTORYKH TYAZHELYKH METALLOV),
Stavropolskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
D. G. Garkusha, P. M. Kuznetsov, and R. S. Fogileva.
Zhurnal Analiticheskoi Khimii, Vol 29, No 11, p 2295-2298, November, 1974. 5 fig, 1 tab, 5 ref.

Descriptors: *Lignins, *Waste water treatment, *Ion exchange, *Copper, *Cobalt, *Iron, *Nickel, Metals, Alkalinity, Activated carbon, Hydrogen ion concentration, Separation techniques, Cation exchange, Water pollution sources, Yeasts, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water purification, Adsorption, Ions, Heavy metals.

Wastes from a feed yeast plant were used as the source of lignin for studying its ability to remove traces of Fe(III), Co(II), Ni(II), and Cu(II) ions from 29 solutions of alkali metal salts as functions of ion concentration and pH. Chromatographic columns were packed with lignin or with layers of lignin and activated charcoal separated by a filter paper disk. At concentrations of 0.01 to 0.00001 molar the removal of Cu was almost complete over the entire range, while only approximately 50% of the Ni was removed. The removal of Fe ions decreased with increasing concentration. How-

ever, with the lignin-charcoal column the Fe was removed at the same high level over the entire concentration range. Removal of the heavy metal ions increased with increasing pH, reaching a maximum at pH 4-5. Further increases in the pH did not increase the adsorption of the metal ions from the solutions. The sharp rise in the pH of filtrates after passage of the solutions through the lignin indicated that H ions were being exchanged for the metal ions, i.e., the lignin was acting as a cation-exchange resin. The ion-exchange capacity of the lignin at pH 4-5 for the metal ions was determined. Analyses of the filtrates indicated that the amount of lignin washed out decreased rapidly with increasing amounts of solution passing through it. (Chern-IPC)
W75-08543

APPLICATION OF ACID/PRESSURE FLOTATION TO THE THICKENING OF EXCESS ACTIVATED SLUDGE (ZASTOSOWANIE FLOTACJI KWASNOCISNIENIOWEJ DO ZAGESZCZANIA NADMIERNEGO OSADU CZYNNEGO),
Prosan (B.P.), Warsaw (Poland).
A. Olezczyk.
Prace Naukowe Instytutu Inzynierii Ochrony Srodowiska Politechniki Wroclawskiej, No 20, p 115-129, 1973. 6 fig, 4 tab, 11 ref.

Descriptors: *Activated sludge, *Dewatering, *Sludge treatment, Air, Acids, Sludge, Neutralization, Lime, Ammonia, Laboratory tests, Foreign research, Hydrogen ion concentration, Industrial wastes, Water pollution sources, Water pollution control, Wastes, *Waste water treatment, Polyelectrolytes.
Identifiers: *Acid/pressure flotation, Sulfuric acid, Sodium hydroxide.

Flotation experiments were carried out in the laboratory with two samples of excess sludge from the purification plants at the Ostroleka and Swiecie mills. The concentration of the sludge was 0.55%, the pH about 7.5. Neither sludge could be thickened by gravitation, even at high doses of polyelectrolytes or other additives. In preliminary experiments, attempts were made to achieve flotation by air pressure (0.5-3.5 kg/sq cm) or by the addition of concentrated sulfuric acid (0.1-1 ml/250 ml sludge). Both were unsuccessful. Pressure increased the concentration to 1.7%, but a part of the suspension sedimented and the liquid discharged contained a considerable amount of suspended solids. There was no sedimentation in chemical flotation and the concentration was increased to over 2%, but the process was slow, requiring long residence time. A combination of air pressure and chemical treatment gave satisfactory results. Within 20 minutes, about 80% reduction of the sludge volume was obtained, and the thickened sludge sedimented only with difficulty. The maximum acid needed was 1 ml/liter sludge. The thickened sludge can be neutralized with lime, NaOH, or ammonia, depending on the method of further processing. The combined flotation method reduces the filtration resistance of the sludge, so that it is dewatered easily in vacuum filters, filter presses, or drying beds. (Stapinski-IPC)
W75-08544

STATISTICAL ANALYSIS OF THE PROCESS OF EFFLUENT PURIFICATION AT THE BAIKAL PULP MILL FOR THE PURPOSE OF CONTROL (STATISTICHESKII ANALIZ PROTSESSA OCHISTKI STOCHNYKH VOD BAIKAL'SKOGO TSELLYULOZNOGO ZAVOD DLYA TSELEI UPRAVLENIYA),
N. E. Milagina, V. Z. Ponizovskii, A. Ya. Rudomir, and V. M. Khushutdinova.
Sbornik Trudov Vsesoyuznyi Nauchno-Issledovatel'skii Institut Tsellyulozno-Bumazhnoi Promyshlennosti No 62, p 59-69, 1973. 7 fig, 2 tab.

Descriptors: *Statistical methods, *Waste water treatment, *Pulp wastes, Treatment facilities,

Computer models, Biological treatment, Chemical precipitation, Aeration, Temperature, Hydrogen ion concentration, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Color, Nitrogen, Phosphorus, Water pollution sources, Water pollution, Water pollution control, Industrial wastes, Wastes, Waste treatment.
Identifiers: Lake Baikal(USSR).

A statistical analysis was made, with the help of a computer, of the effluent purification process at the Baikal pulp mill, based on daily and two-hour data from the purification plant laboratory for a period of 8 months. Calculations were made of the means of the parameters and of standard deviations, and tests were conducted of normal distribution. The samples analyzed were taken at various points of the purification equipment which consists of biological purification, chemical purification, mechanical treatment, and final aeration treatment. A diagram is given of the purification plant on which the sampling points are indicated. The parameters studied included temperature, pH, BOD, COD, oxidizability, suspended solids content, color, and nitrogen and phosphorus contents. The results of the analysis are discussed in terms of the effect of the individual variable fluctuations on the process and the levelling action of the equipment units. (Stapinski-IPC)
W75-08547

FOR A CLEAN DIGESTER (FUR EINEN SAUBEREN KOCHER).
Allgemeine Papier-Rundschau, No 35, p 990, 992, September 5, 1974. 2 fig.

Descriptors: *Activated sludge, *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Water purification, Biological treatment, Foreign countries, Europe.
Identifiers: *Bio-sedimat clarifiers.

The biological clarification plant installed at Papierfabrik Palm KG (West Germany) is briefly described. The system consists essentially of Bio-Sedimat activated sludge clarifiers. (Speckhard-IPC)
W75-08548

TREATMENT AND DISPOSAL OF WASTE-WATER SLUDGES,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
P. A. Vesilind.
Ann Arbor Science Publishers, Ann Arbor, Michigan, 1974. 236 p.

Descriptors: *Sludge disposal, *Sludge treatment, Volume, Stabilization, Pumping, Dewatering, Drying, Incineration, Water pollution sources, Sludge, Solid wastes, Wastes, Sewage sludge, *Waste water treatment, *Waste treatment.

This graduate-level text discusses effluent sludge sources, volumes, characteristics, stabilization, pumping, thickening, dewatering, conditioning, drying, combustion, and ultimate disposal. Laboratory exercises are appended. (Brown-IPC)
W75-08552

ROLE AND CHARACTERISTICS OF THE BIOSORPTION PROCESS IN THE PURIFICATION OF EFFLUENTS FROM HYDROLYSIS FACTORIES (ROL' I ZAKONOMERNOSTI PROTSESSA BIOSORBTSIIPRI OCHISTKE STOKOV GIDROLIZNOGO PROIZVODSTVA),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
T. V. Zharova, Yu. S. Sedova, and N. A. Skachkova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 8, p 13-14, 1974. 4 fig, 3 ref, 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Yeasts, Activated sludge, Waste water(Pollution), Wastes, Industrial wastes, Water pollution sources, Aeration, Biochemical oxygen demand, Chemical oxygen demand, Biodegradation, Liquid wastes, Water pollution treatment, Hydrogen ion concentration, Effluents, Oxidation, Waste treatment, Foreign countries.
Identifiers: USSR, Hydrolysis industry.

In the biological purification process, the first stage, which is quite rapid, is the adsorption (biosorption) of effluent components on the surface of activated sludge cells. This process was studied on samples of residual liquor from yeast production. The samples were aerated in the presence of activated sludge for varying times, and determinations were made of the 5- and 20-day BOD and COD. According to data obtained, up to 30% impurities are removed within the first minute of contact with the sludge. The biosorption continues for about 30 minutes, but at a low rate, so that the final amount of impurities removed corresponds to a maximum of about 50% 5-day BOD. During the next 1.5-2 hr the BOD remains constant, then the biooxidation process begins. The amount of impurities sorbed depends on the concentrations of the sludge and the effluent and on the pH. The amount sorbed increases linearly with the concentration of the sludge up to 1.5-2 g/liter, then increases only slightly with concentration. Biosorption is reduced by lowering the pH to 4.2-4.35, is higher and approximately constant at pH 5-7, and increases again at pH 8. The sorption power of activated sludge regenerated after full oxidation of effluents was lower than that of sludge from the aeration tank. Biosorption can be recommended as the first independent stage in biological purification of effluents. (Stapinski-IPC)
W75-08553

STUDIES ON ACTIVATED-SLUDGE BIOLOGICAL TREATMENT OF PAPER MILL EFFLUENT (STUDIO SUL TRATTAMENTO BIOLOGICO A FANGHI ATTIVI APPLICATO AD UN EFFLUENTE DI CARTIERA),
V. Scarlata, and E. Porrozzi.
Cellulosa e Carta, Vol 25, No 10, p 51-59, Oct., 1974. 2 fig, 17 ref, 2 tab, English summary.

Descriptors: *Activated sludge, *Pulp wastes, *Waste water treatment, *Biological treatment, Industrial wastes, Wastes, Waste treatment, Water pollution sources, Water pollution control, Pilot plants, Foreign countries, Europe, Foreign research, Phosphorus, Nitrogen, Water purification, Chemical oxygen demand, Biochemical oxygen demand, Nutrients.
Identifiers: Waste paper, Corrugating medium.

Activated-sludge tests in a 24-liter/day pilot plant were carried out at ENCC (Ente Nazionale per la Cellulosa e per la Carta) on the effluent from a mill producing corrugating medium from waste paper. The biological treatment reduced COD and BOD to satisfactory levels. The effect of phosphorus and nitrogen on the purification capacity was also examined. (Speckhard-IPC)
W75-08555

TREATMENTS OF BASIC DYES BY MICROBIAL POPULATIONS IN ACTIVATED SLUDGE (IN JAPANESE),
Gifu Univ. (Japan). Faculty of Engineering.
T. Ogawa, E. Idaka, and Y. Yamada.
Journal of the Society of Fiber Science and Technology, Japan (Sen-i Gakkaishi), Vol 30, No 11, p T516-T522, 1974. 7 fig, 2 tab, 13 ref, English summary.

Descriptors: *Dyes, *Microorganisms, *Activated sludge, *Waste water treatment, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Flocculation, Water pollution treatment, Water purification, Biological treatment, Microbial degradation, Sewage treatment.

Identifiers: Basic Violet 1, Basic Orange 22, Acid dyes, Basic dyes, Direct dyes.

To elucidate the cultural conditions and the inhibitive mechanism in the biological treatment of basic dyes, the dye concentration, cell concentration, and uptake of oxygen in the medium were measured in cultures on a reciprocating shaker. The cultures were maintained at 30C in a medium of peptone, meat extract, glucose, and mineral salts. To treat the dye solution effectively at 20 ppm, the media should contain 100 times the BOD of the average sewage sample at pH 7.5. Ninety percent of the Basic Violet 1 was removed in 24 hr because of the high bioflocculation capacity despite strong toxicity, while only 10% of Basic Orange 22 was removed because of low bioflocculation capacity. Repeated inoculation of a medium with the same composition resulted in a reduction of the lag phase of the growth curve. When the microorganisms acclimated to Basic Violet 1 were inoculated to the medium containing other dyes, acclimatization of microorganisms was maintained for the basic dyes of the homologous series, but not for the basic dyes of other series, acid dyes, or direct dyes. (Witt-IPC)
W75-08557

AMINE TREATMENT PROCESS FOR THE DECOLORIZATION OF PULP MILL EFFLUENTS. PART I. LABORATORY STUDIES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
S. Prahacs, A. Wong, and H. G. Jones.
AICHE (American Institute of Chemical Engineers), Symposium Series, Vol 70, No 139, p 11-22, 1974. 13 fig, 15 ref, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Color, Water pollution sources, Wastes, Industrial wastes, Economics, Capital costs, Operating costs, Bleaching wastes, Water pollution, Water pollution control, Waste treatment, Laboratory tests, Foreign research, Research facilities, *Canada, Foreign countries, North America.
Identifiers: *Amines.

Studies on the applicability and possible improvements in the technical performance and economics of using high-molecular weight amines for the removal of color from kraft pulp mill effluents are described. The laboratory investigations with effluents from Canadian mills confirmed the high degree of decolorization (90-99%) attainable with this technique. Process improvements resulting from the study are described. Preliminary economic estimates for a 500 ton/day bleached kraft pulp mill indicate that the treatment of the caustic extraction stage effluent, the principal source of color in a typical bleached kraft mill, would require a capital cost of $600,000 and an operating cost of approximately $1.40/ton of pulp. (Witt-IPC)
W75-08559

LA CELLULOSE DU PIN REDUCES ITS SOURCES OF POLLUTION (LA CELLULOSE DU PIN REDUIT SES SOURCES DE POLLUTION),
D. Ladmiral.
La Papeterie, Vol 96, No 12, p 814-822, December 1974. 17 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Biological treatment, Activated sludge, Aerated lagoons, Water purifications, Odor, Sulfite liquors, Industrial wastes, Wastes, Waste treatment, Pulp and paper industry, Foreign countries, Europe, Forestry, Fertilization, Forest management, Waste disposal, Irrigation, Waste disposal.

Described are the effluent treatment facilities (activated sludge treatment plus aerated lagooning) at a bisulfite pulp mill at Tartas (France), the effluent treatment facilities (biological treatment plus spreading over forest stands for highly colored effluent and biological treatment plus clarification for less colored effluent) at the kraft mill at Roquefort, and the overall operations for the pulp and paper mill at Facture (including effluent and odor treatment facilities). Some woodland plantation and fertilization operations are also briefly covered. (Speckhard-IPC)
W75-08560

HIGH-PURITY OXYGEN APPLICATION AT THE CHESAPEAKE CORPORATION OF VIRGINIA,
Chesapeake Corp. of Virginia, West Point.
B. Djordjevic, A. W. Plummer, and W. D. South.
TAPPI Annual Meeting (New York), Preprinted Proceedings (TAPPI, Atlanta, Ga.), p 99-111, Feb. 24-26, 1975. 4 fig, 4 tab, 7 ref.

Descriptors: *Oxygenation, *Waste water treatment, *Bleaching wastes, *Pulp wastes, Waste treatment, Water pollution sources, Industrial wastes, Oxygen, Water pollution treatment, Oxidation, Wastes, Water pollution control, Water purification, Pulp and paper industry, Virginia.
Identifiers: *Kraft mills, *Black liquors, *MoDo-CIL bleaching process, UNOX oxygenation system.

Chesapeake Corporation of Virginia recently started up an on-site cryogenic oxygen generation plant at its West Point, Virginia, pulp and paper mill. The oxygen is used for kraft pulp bleaching, for waste water treatment, and for oxidation of black liquor to reduce odorous emissions. Descriptions are given of the oxygen-generating plant, the MoDo-CIL oxygen bleach plant, the effluent treatment plant with its UNOX system, and the black liquor oxidation system. Initial operating problems and typical operating results with these units are given. (Brown-IPC)
W75-08562

REVERSE OSMOSIS MAKES HIGH QUALITY WATER NOW,
Universal Oil Products Co., San Diego, Calif.
For primary bibliographic entry see Field 3A.
W75-08564

ENVIRONMENTAL PROTECTION IN KRAFT PULP MILLS,
Munksjo A.B., Jonkoping (Sweden).
A. Knuts, U. Albertsson, and S-O. Sandberg.
Journal Water Pollution Control Federation, Vol 47, No 4, p 783-788, April 1975.

Descriptors: *Pulp wastes, *Waste water treatment, Industrial wastes, Effluents, Water pollution sources, Foreign countries, Europe, Pulp and paper industry, Wastes, Sludge, Water pollution control, Waste water(Pollution), Waste treatment, Chemical precipitation, Closed conduits.
Identifiers: Sweden, Cross recovery, Spills, Clarifiers, Evaporator condensates, Digester condensates, Closed pulping system, Kraft mills.

A survey is given of environmental protection techniques in the pulp industry. The applications of these techniques are exemplified by a description of environmental protection practices at two kraft mills of Munksjo AB. (Sweden). The description includes pulping in a completely closed liquor system, treatment of condensates, systems for handling temporary discharges, chemical treatment of waste water in a clarifier, sludge handling, and cross recovery. (Witt-IPC)
W75-08566

A SURVEY OF THE YOKOHAMA MUNICIPAL NANBU SEWAGE TREATMENT PLANT (YOKOHAMA-SHI HANBU GESUI SHORIJO NO GAIYO),
S. Ogura.
Gesuido Kyokaishi, Vol 11, No 123, p 54-61, August 1974. 8 fig, 1 tab.

Descriptors: *Planning, *Municipal wastes, *Sewage treatment, Construction, Equipment, Design criteria, Sludge, Waste treatment, Biochemical oxygen demand, Suspended solids, *Treatment facilities.
Identifiers: Sewage treatment plants, Japan, Nanbu Sewage Plant.

A sewage works and treatment plan was initiated in 1962 in Yokohama. One plant, the Nanbu plant, covers 2965 ha, and services a population of 670,000. Construction was started in 1962 and operation was begun in July, 1965. With subsequent gradual expansion, the plan is to be completed during 1974. The plant's constituents are 32 percent commercial, 8 percent industrial or sub-industrial, and 60 percent residential. The sewage BOD is about 200 mg/liter, and suspended solids are about 300 mg/liter, of which 200 mg/liter is settled. The step anaerobic digestion sludge treatment is designed to eliminate 90 percent of BOD--down to 20 mg/liter, and 85 percent of suspended solids--down to 45 mg/liter. In the adjacent area is a city refuse incinerator with a maximum capacity of 450 ton/day; part of its steam production is used for heating the sludge digestion tank. After the digestion gas is desulfurized, part of it can be used as supplementary fuel for the incinerator. Scrub water for the incinerator is supplied by treated sewage water, and the waste water is returned to the plant. The main facilities of the plant are: settling ponds, electrical machinery rooms, initial precipitation ponds, aeration tanks, final precipitation tanks, chlorine mixture tanks, return sludge pump rooms, sludge condensation pump rooms, sludge condensate tanks, blowers, sludge treatment rooms with deodorization systems, sludge digestion tanks, sludge scrubbers, and sludge dryers. (Seigle-FIRL)
W75-08567

SPLIT CHLORINATION: YES-NO,
V. Kothandaraman, and D. B. Beuscher.
Water and Sewage Works, Vol 121, No 7, p 90-92, July 1974. 3 tab, 9 ref.

Descriptors: *Water pollution, *Waste water treatment, *Effluent control, *Disinfection, *Chlorination, Water purification, Sampling, Bacteria, Membrane processes, Coliforms.
Identifiers: *Split-chlorination, Secondary waste effluents.

Continuous disinfection of wastewater effluents likely to contain fecal coliform bacteria has become mandatory in Illinois. The principal method used for disinfection is chlorination. Since chlorination practices in wastewater treatment are expensive, greater efforts are being directed to improve process efficiency. The split chlorination process consists of administering a portion of the total applicable chlorine dosage at the head end of the contact chamber and the remainder of another location along the contact basin. The efficiency of the split chlorination of secondary waste effluents was investigated. The extent of bacterial kill with split chlorination, under both quiescent and air agitated conditions, were evaluated separately and compared with the bacterial kill obtained from single point chlorination under quiescent conditions, all in batch reactors. Based on the results obtained, split chlorination does not appear to be an advantageous procedure in wastewater chlorination practice. (FIRL)
W75-08568

SYSTEMS ANALYSIS OF CENTRALIZED REACTIVATION OF EXHAUSTED CARBON IN WASTEWATER TREATMENT,
Michigan Univ., Ann Arbor.
J. S-y. Hsu.
Available from University Microfilms, Inc., Ann Arbor, Michigan 48106. Order No. 74-15,756. PhD Dissertation, 1973. 137 p.

Descriptors: *Waste water treatment, *Activated carbon, *Tertiary treatment, Regional economics, Mathematical studies, Model studies, Numerical analysis, Estimated costs, *Systems analysis.
Identifiers: *Carbon reactivation.

A system in which industrial and/or municipal waste water treatment plants of a region transport their exhausted carbon to one or more central furnaces for reactivation can result in savings in the total cost of carbon reactivation. Such a system is described. Based on empirical data, four major costs are estimated and expressed as mathematical functions of the reactivation demand. From these cost functions two location models were constructed. Some numerical results were obtained based on a region of 150-mile radius. (Sandoski-FIRL)
W75-08569

MATHEMATICAL MODELING OF UN-STEADY-STATE THICKENING OF COMPRESSIBLE SLURRIES,
Clemson Univ., S.C.
K. D. Tracey.
Available from University Microfilms, Inc., Ann Arbor, Michigan 48106. Order No. 74-16,117. PhD Dissertation, 1973. 202 p.

Descriptors: *Mathematical models, *Sludge treatment, *Sedimentation, Performance, Simulation analysis, Activated sludge, Treatment facilities, Design criteria, Model studies, *Waste water treatment, Slurries.
Identifiers: *Sludge thickening.

A dynamic mathematical model of the sludge thickening process has been formulated and the model is verified by conducting laboratory scale continuous thickening experiments. The model was based on the assumption that the downward movement of solids in a thickener was the result of two factors, gravitational sedimentation and bulk flow resulting from the withdrawal of the underflow. The model was used to simulate the performance of the secondary clarifier in the activated sludge process. Such simulations served to illustrate the utility of the model as a tool in the design and operation of water and waste water treatment facilities. The thickener model should be coupled with other process models to simulate unit interactions. (Sandoski-FIRL)
W75-08570

MATHEMATICAL MODELING OF HETEROGENEOUS SORPTION IN CONTINUOUS CONTRACTORS FOR WASTEWATER DECONTAMINATION,
Clemson Univ., S.C.
R. P. Carnahan.
Available from Univ. Microfilms, Inc. Ann Arbor, Mich. 48106. Order No 74-16,113. PhD Dissertation, 1973. 172 p.

Descriptors: *Mathematical models, *Adsorption, *Waste water treatment, Activated carbon, Model studies, Kinetics.

Because of strict water quality standards legislation, interest has increased in the use of activated carbon to remove trace contaminants. An analytical description of multi-solute adsorption equilibrium and a description of contractor dynamics as it effects mass transfer were derived. These were prerequisite in the development of a predictive model for adsorption of multisolutes of activated carbon by a differential contacting system. Results of the model studies indicated that the use of the film diffusion expression for adsorption kinetics as the semi-competitive Langmuir expression provided good agreement with experimental data at low concentrations. (Sandoski-FIRL)
W75-08571

RESEARCH ON REVERSE OSMOSIS MEMBRANES FOR PURIFICATION OF WASH WATER AT STERILIZATION TEMPERATURE (165F), REPORT NO 2,
General Electric Co., Lynn, Mass. Direct Energy Conversion Programs.
For primary bibliographic entry see Field 3A.
W75-08575

INVESTIGATION OF RATIONAL EFFLUENT AND STREAM STANDARDS FOR TROPICAL COUNTRIES,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 5G.
W75-08584

PURIFYING APPARATUS FOR PURIFYING CONTAMINATED WATER,
Sanaqua S.A., Geneva (Switzerland). (assignee)
S. Nordgard.
US Patent No, 3,875,058, 4 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 340, April 1, 1975.

Descriptors: *Waste water treatment, *Patents, *Microorganisms, *Water purification, *Aeration, Equipment, Baffles.
Identifiers: Helical baffles.

Water purifying apparatus has a cylindrical casing rotatably supported in a tank containing contaminated water. The casing contains a helical baffle and is rotated so that contaminated water flowing in a through one end of the casing is displaced to an outlet at the other end by the helical baffle and thereby brought into contact with microorganisms on the helical baffle. The apparatus is provided with a buoyancy jacket or pontoons for buoyantly supporting the apparatus on the contaminated water. (Sinha-OEIS)
W75-08613

SEPARATION OF LIQUIDS FROM WET SOLIDS,
Harleyford Hydrosand Equipment Co. Ltd., Marlow (England). (assignee)
A. T. Lovegreen.
US Patent No 3,873,450, 6 p, 12 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 932, No 4, p 1554, March 25, 1975.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Sewage treatment, Solid wastes, Equipment, Animal wastes(Wildlife), Effluents, *Separation techniques.
Identifiers: Wet solids.

A water/solid mixture such as sewage or animal effluent is separated on a perforated moving endless belt with the addition of a compression stage for retained material. The perforations may be transverse slits. There may be an oversize indicator and/or water disintegration step prior to pressing, and/or a scraper and/or belt cleaning air supply after pressing, together with brushes and water sprays on the belt return flight. Compression may be effected by a roller but preferably by a second belt optionally provided with individually biassed pressing rollers inside. (Sinha-OEIS)
W75-08619

METHOD OF RECOVERING NOIL FIBRES AND SOLUBLE WOOD MATERIAL FROM WASTE WATER,
Savo Oy, Kuopio (Finland). (assignee)
E. K. Brax.
US Patent No 3,873,418, 6 p, 10 ref; Official Gazette of the United States Patent Office, Vol 932, No 4, p 1545, March 25, 1975.

Descriptors: *Patents, *Waste water treatment, *Wood wastes, Pulp and paper industry, *Pulp wastes, *Pollution abatement, Water pollution control, Water reuse, Reclaimed water.
Identifiers: Noil fibers, White water.

A method of recovering noil fibres and soluble wood material in white water from a manufacturing process involves the formation of a pulp web by separating flocked out material from water to produce cleared water and returning the material flocked out to the pulp web for retention has a beneficial constituent of the manufactured product. The method comprises adding a sufficient quantity of an alkaline substance to white water to prevent premature coagulation of suspended material; then adding as a coagulating agent a material whose presence in the pulp web formed is beneficial. It is selected from the group consisting of phenolformaldehyde resin, carboxymethylcellulose, urea resin, melamine, linseed oil emulsion, polyvinylchloride-latex emulsion and acrylic latex emulsion. The white water is thoroughly mixed with the coagulating agent to obtain a substantially homogeneous suspension. After mixing, a sufficient quantity of an acidic substance is added to the suspension to lower the pH to form flocks incorporating the coagulating agent, noil fibres and soluble wood material from the white water. Water is separated from the flocks by gravity separation to obtain cleared water which is recycled for use in manufacturing processes. The flocks are returned to the pulp web to form constituent material in the final product of the manufacturing process. (Sinha-OEIS)
W75-08620

AEROBIC SEWAGE TREATMENT SYSTEM,
Coate Burial Vault, Inc., West Milton, Ohio. (assignee)
K. J. Yost.
US Published Patent Application B 340,833, 4 p 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 930, No 4, p 1613, January 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Aerobic treatment, *Sewage treatment, Treatment facilities, Pollution abatement, Water pollution control, Water quality control, Organic wastes, Dissolved oxygen.

Water containing organic solid material is directed into one end of a shallow rectangular tank having a cover and a series of internal walls defining a series of longitudinally disposed treating chambers. The water is maintained within each chamber at a level slightly below the cover, and low pressure air is continuously injected into an air supply pump into each chamber. This produces circulation of the water around a baffle projecting downward from the cover and causes diffusion of the air into the water for dissolving the solid material. Air supply and exhaust passages for each chamber are formed within the cover, and air is also directed in series through the chambers. The purest water within each chamber at the water surface is directed into the water within the adjacent chamber below the surface to provide a series of successive aerobic treatments which result in producing a progressively purer water and a clear discharge effluent having a high percentage of dissolved oxygen. (Sinha-OEIS)
W75-08625

WASTE OXIDATION PROCESS,
Sterling Drug, Inc., New York. (assignee)
L. A. Pradt, and J. A. Meidl.
US Patent No 3,876,536, 3 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 831, April 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage sludge, *Oxidation, *Activated carbon, Pollution abatement, Biomass, Organic wastes, *Biological treatment.
Identifiers: Wet air oxidation.

A process is described for treating raw sewage sludge or night soil by wet air oxidation at a temperature between 150 deg and 375 deg C, and a pressure between 150 and 4,000 psig. A reduction

of between 30 and 70 percent in chemical oxygen demand is obtained, separating the gaseous, liquid and solid phases from the oxidation, and biologically oxidizing the liquid phase in an aeration contact tank containing a biomass suitable to effect biological oxidation of the organic solutes present in the liquid phase. Powdered activated carbon is maintained in the aeration contact tank in an amount sufficient to enhance the bio-oxidation and substantially reduce the odor and color of the liquid phase. The biological oxidation is carried out until excess biomass builds up and the activated carbon becomes spent. A mixture of the excess biomass and spent carbon is transferred to a wet oxidation reactor and the mixture is oxidized under conditions similar to those used for wet air oxidation of the raw sewage sludge so as to regenerate the powdered activated carbon for further use in the biological oxidation step and at the same time disposing of the excess biomass. (Sinha-OEIS)
W75-08627

INSTALLATION FOR SEPARATION ON THE SEABED OF THE EFFLUENTS FROM UNDERWATER OIL WELLS,
Entreprise de Recherches et d'Activities Petrolieres, Paris (France).
For primary bibliographic entry see Field 5G.
W75-08629

FOUR-MEDIA FILTER,
Neptune Microfloc, Inc., Corvallis, Oreg. (Assignee).
A. K. Hsiung, and W. R. Conley.
U S Patent No 3,876,546, 6 p, 8 fig, 9 tab, 6 ref; Official Gazette of the United State Patent Office, Vol 933, No 2, p 834, April 8, 1975.

Descriptors: *Patents, *Specific gravity, *Water treatment, *Waste water treatment, Pollution abatement, *Filters, Coals, Silica, Equipment, Water pollution control, *Filtration.
Identifiers: Garnet, Ilmenite.

A filter bed comprises four filter media of different specific gravities and sizes. The media are intermixed in such a manner that the number of particles continually increases in the direction of fluid flow through the bed. The media comprise coal of two different size ranges and specific gravities, plus silica sand and garnet. The first filter medium comprises coal having a specific gravity in the range between about 1.30 and 1.50. The second filter medium comprises coal having a specific gravity in the range between about 1.60 and 1.80. The third filter medium comprises silica sand having a specific gravity in the range between about 2.60 and 2.65 and the fourth filter medium comprises particles selected from the group consisting of garnet particles and ilmenite particles. (Sinha-OEIS)
W75-08632

APPARATUS FOR PHYSICALLY AND BIOLOGICALLY PURIFYING SEWAGE,
A. Schreiber, B. Schreiber, and E. Schreiber.
U S Patent No 3,876,543, 6 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 833, April 8, 1975.

Descriptors: *Waste water treatment, *Patents, *Filters, *Sewage treatment, *Aeration, Microorganisms, *Biological treatment, Pollution abatement, Equipment, Sludge treatment, Filtration.
Identifiers: Biological filters, Compressed air.

A combination filter-biofilter containing a bed of artificially aerated filler material is used for physically and biologically purifying sewage. The sewage is preliminary clarified and distributed evenly over the filler material and is caused to flow through the latter for a limited time until the sewage has coated the surfaces of the filler material with sludge and microorganisms to an extent

that the passage of air through the filler bed is substantially decreased because of encrustation of the interstices of the filler material. At this point the flow of sewage through the filler material is halted and the bulk of the sludge is removed from the filler material by turning the same over with air. Then, the flow of sewage through the filler material is reinstituted. An abrasion resistant filler material is used and for purposes of turning-over the filler material, the bed of the latter is filled with water and the water and the filler material are turned over within the filter-biofilter by means of blown-in compressed air. At the same time the released sludge is drawn off. The turning-over of the filler material and water are accomplished gradually in a horizontal direction through the contents of the filter-biofilter. (Sinha-OEIS)
W75-08633

LIQUID WASTES REDISTRIBUTION APPARATUS,
Neptune Microfloc, Inc., Corvallis, Oreg. (Assignee).
E. R. Carlson.
U S Patent No 3,876,542, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 833, April 8, 1975.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, Pollution abatement, Water pollution control, *Biological treatment, *Filters, Equipment, *Filtration.
Identifiers: Biological filters.

The apparatus is comprised of a liquid wastes distribution media positioned between the top of biological filter media and distribution discharge outlets. The redistribution media is formed with vertically spaced and superimposed layers of upward facing horizontal surfaces with openings for downward flow of the liquid wastes to the filter media. The horizontal surfaces are formed and arranged to interrupt, retard and redistribute the liquid wastes and may include a maze-like flow channel to reduce surges in filter loading. Lath-like horizontally oriented, relatively spaced, side-by-side members preferably provide the redistribution media, and the layers of members may be relatively staggered and/or oriented in an intersecting manner to eliminate vertical channels. (Sinha-OEIS)
W75-08634

PACKED BED REACTOR APPARATUS FOR WASTEWATER TREATMENT,
General Filter Co., Ames, Iowa. (Assignee).
M. H. Anderson, and J. J. Scholten.
U S Patent No 3,876,541, 5 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 832, April 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Aerobic bacteria, *Pollution abatement, Equipment, Organic wastes, *Biological treatment.

'Packed Bed' reactor apparatus for treatment of wastewater by aerobic bacterial action includes a tank containing a horizontally and vertically extending bed of particulate medium capable of supporting aerobic bacterial growth, and an outlet for removing the treated wastewater from the upper portion of the tank. The improvement is characterized by providing the lower portion of the tank with combined water and air inlets. The air distribution pipes extend within the water distribution pipes with releasable connections interposed between the air header and the ends of the air pipes. Access is also provided so that the releasable air connections can be reached from outside of the tank, permitting the air pipes to be disconnected and removed from the water pipes for inspection and servicing without disturbing the bacterial treatment bed and permitting cleaning the interior of the water distribution pipes which may foul with organic growths. (Sinha-OEIS)
W75-08635

SKIMMING DEVICE,
Societe Nationale des Petroles d'Aquitaine, Paris (France). (Assignee).
H. Falxa.
U S Patent No 3,876,540, 3 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 832, April 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Skimming, *Pollution abatement, Brines, Ponds, Oil fields, Chemical wastes, Oil pollution, Pulp and paper industry, Separation techniques.
Identifiers: Oil refineries.

A floating devices is described to skim still liquids without disturbing the lower depths. The device consists of a shallow funnel, submerged in the liquid and equipped with means for draining off the extracted liquid. The level of submersion, governing the amount of liquid drawn off, is regulated by a set of floats, which are either ballasted or adjusted in height, possibly by remote control. The main applications of this appliance are in the treatment of open-air brine ponds and tanks for residual water in oil fields, refineries, paper mills and other chemical industries. (Sinha-OEIS)
W75-08636

MULTI-TANK ION EXCHANGE WATER TREATMENT SYSTEM,
Rock Valley Water Conditioning, Inc., Rockford, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W75-08637

PROCESS FOR DISPOSING OF AQUEOUS SEWAGE AND PRODUCING FRESH WATER,
Texaco, Inc., New York. (Assignee).
H. V. Hess, W. F. Franz, and E. L. Coleman.
U S Patent No 3,876,538, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 933, No 3, p 831, April 8, 1975.

Descriptors: *Patents, *Pollution abatement, *Sewage treatment, Water pollution control, *Waste water treatment, Freshwater, Oxidation, Brines, Gravity separation, Chemical oxygen demand, *Biochemical oxygen demand, Organic compounds, *Sewage treatment, Waste disposal.
Identifiers: Coke.

The process involves coking sewage or sewage sludges in the liquid phase in the absence of added free oxygen under a pressure of 300 to 3500 psi at a temperature of 400 deg to 700 deg F for 0.5 minutes to 6 hours to form gases, coke and an effluent having a reduced COD and BOD as compared with that of the charge. The effluent is oxidized with O2 to further reduce its COD and BOD and contacted with a hot hydrocarbon liquid characterized by its ability to extract a greater amount of water at a high temperature than at a lower temperature. This contact results in a substantial amount of the water dissolving in the hot hydrocarbon and in the production of a concentration 'brine' phase containing dissolved inorganic salts which are physically separated. The hot hydrocarbon-water solution is cooled by an amount sufficient to produce a water phase and a hydrocarbon phase which are separated by gravity. (Sinha-OEIS)
W75-08638

METHOD OF INSOLUBILIZING DEMINERALIZER AND COOLING TOWER BLOWDOWN WASTES,
Industrial Resources, Inc., Chicago, Ill. (Assignee).
J. M. Dulin, E. C. Rosar, H. S. Rosenburg, and J. M. Genco.
U S Patent No 3,876,537, 10 p, 5 fig, 6 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 831, April 8, 1975.

Descriptors: *Patents, *Demineralization, *Cooling tower, *Pollution abatement, Water pollution control, Aeration, Chemical wastes, Bacteria, Hydrogen ion concentration, Waste treatment.
Identifiers: *Sulfate wastes, Sodium sulfur oxides, Sodium sulfite.

A process for insolubilizing water soluble sodium sulfur oxide wastes resulting from backwash of process feed-water demineralizers and cooling tower blowdown wastes is disclosed. The sodium sulfur oxide wastes, typically sodium sulfate and sulfite, are reacted in solution with ferric ions and sulfuric acid to produce insoluble, basic hydrous or anhydrous sodium hydroxy ferric sulfate or sulfite compounds. The principal insoluble compounds include Natrojarosite, Metasideronatrite, Sideronatrite, Depegite which is a mixture of Sideronatrite, Rosarite and Iriite, and mixtures thereof. The reaction takes place at an acid pH in a temperature ranging from about 50 deg - 300 deg F and may occur in single or multistage reactors. Air and/or bacterial activation at a pH of less than about 5.5 may be employed. The end-product basic, sodium hydroxy ferric sulfate and sulfite compounds are substantially water insoluble, having a solubility of less than the standard calcium sulfate, and may be disposed of by simple landfill without the water pollution hazards inherent with landfilling of wet or dry sodium sulfite or sulfate wastes. (Sinha-OEIS)
W75-08639

WASTE TREATMENT AND HANDLING PROCESSES ANNUAL REPORT,
Battelle-Pacific Northwest Labs., Richland, Wash.
L. K. Mudge, R. A. Walter, and G. F. Schiefelbein. Available from the National Technical Information Service, Springfield, Va 22161 as Rept No BNWL-1861, $5.45 in paper copy, $2.25 in microfiche. BNWL-1861, UC-70, September 1974. 41 p, 12 fig, 11 tab, 4 ref.

Descriptors: *Radioactive waste disposal, *Management, *Waste treatment, *Nuclear wastes, Research and development, Assessment, Evaluation, Model studies, Design criteria.
Identifiers: *Waste handling.

Laboratory scale studies were conducted to evaluate pyrolysis and gasification processes for the volume reduction of combustible components found in typical alpha waste mixtures. Volume reduction obtained on pyrolysis of a simulated alpha waste mixture at 700 degrees C was by an approximate factor of 2, while volume reduction of simulated feed with air was by a factor of about 20. Gasification of simulated wastes produced an inert stable ash, while prolysis produced a combustible carbonaceous residue. Both gasification and pyrolysis (700 degrees C) of simulated wastes produced about 40% by weight of condensate. The lab studies also showed that fluxes of NaOH and Na2CO3 were effective in retaining chloride in the residue during pyrolysis of PVC. Results obtained on pyrolysis of individual components typically present in alpha wastes are presented. (Houser-ORNL)
W75-08641

TRANSURANIC SOLID WASTE MANAGEMENT RESEARCH PROGRAMS, PROGRESS REPORT FOR APRIL-JUNE, 1974.
Los Alamos Scientific Lab., N. Mex. Health Div. Available from the National Technical Information Service, Springfield, Va 22161 as LA-5762-PR, $4.00 in paper copy, $2.25 in microfiche. Rept No LA-5762-PR, October 1974. 18 p, 6 fig, 5 tab, 16 ref.

Descriptors: *Radioactive waste disposal, *Nuclear waste, *Management, Research and development, *Transporation, Corrosion, Inhibition, Corrosion control, Acids, Pressure, Design criteria, Facilities, Incineration.

Identifiers: *Transuranics.

Progress is reported on three transuranic solid waste management research programs funded by the AEC Division of Waste Management and Transportation. The report covers the period of April-June 1974. Corrosion of mild steel drums and the effectiveness of potential corrosion inhibitors are undergoing continued investigation in a variety of humid environs. One 11-year-old waste container was opened and examined. Exterior corrosion was negligible but substantial interior corrosion had resulted from acid residues in the contained waste materials. Total pressurization rate from radiolytic gases appears to diminish as the total absolute pressure increases. Almost no Cl or HCL was detected in gas samples from radiolysis of chlorinated plastics. The reasons for these phenomena are being investigated. The Facility Design Criteria Report for the waste treatment development facility has been published and an architect-engineer selected for Title I design work. An incinerator was selected and ordered for prefacility testing with nonradioactive materials; it is anticipated that the same type of incinerator will ultimately be installed in the facility. (Houser-ORNL)
W75-08647

COMMERCIAL ALPHA WASTE PROGRAM QUARTERLY PROGRESS REPORT JULY - SEPTEMBER 1974.
Hanford Engineering Development Lab., Richland, Wash.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No HEDL-TME 74-61, $4.00 in paper copy, $2.25 in microfiche. Rept No HEDL TME 74-61, November 1974. 35 p, 4 fig, 12 tab, 6 ref.

Descriptors: *Radioactive waste disposal, Research and development, *Management, *Radioactive wastes, Waste treatment, Waste identification, Waste storage, Waste disposal, Transportation, Fuels, Fabrication.
Identifiers: *Fuel reprocessing.

This is the second Quarterly Progress Report on the Commercial Alpha Waste Program being conducted for the Division of Waste Management and Transportation, USAEC. Progress to date on identification and classification of fuel fabrication and fuel reprocessing wastes is discussed, as well as work on development of the acid digestion process and development work on product storage and disposal of wastes. Data on HEPA (High Efficiency Particulate Air) filter usage throughout the United States also are discussed. (Houser-ORNL)
W75-08651

REPORT TO CONGRESS - DISPOSAL OF HAZARDOUS WASTES.
Environmental Protection Agency Programs. Washington, D.C. Office of Solid Waste Management.
Available from the US Government Printing Office, Washington, DC, as Rept No SW-115, for $1.55. Report No SW-115, 1974. 122 p, 17 fig, 17 tab, 68 ref, 7 append.

Descriptors: *Management, *Waste disposal, *Radioactive waste disposal, *Waste storage, *Federal government, *Administration, Regulation, Public health, Technology, Economics, Research and development, Waste treatment, Transportation, State governments, Toxicity, Legal aspects.

A comprehensive investigation was undertaken of the storage and disposal of hazardous wastes. This document represents Environmental Protection Agency's Report to the President and the Congress summarizing the Agency's investigations and recommendations in response to a congressional mandate. The report is organized into a summary, five major sections, and appendixes.

The congressional mandate and the Agency's response to it are discussed. The public health, technological, and economic aspects of the problem of disposing of hazardous wastes are reviewed. Hazardous waste regulation is discussed. A discussion of implementation issues and a presentation of findings and recommendations are included. (Houser-ORNL)
W75-08666

REMOVAL OF CESIUM AND STRONTIUM FROM FUEL STORAGE BASIN WATER,
Allied Chemical Corporation, Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
M. W. Wilding, and D. W. Rhodes.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No ICP-1048, $4.00 in paper copy, $2.25 in microfiche. Rept No ICP-1048, August 1974. 23 p, 10 fig, 7 tab, 9 ref.

Descriptors: *Water pollution, *Cesium, *Strontium, *Separation techniques, *Waste treatment, Ion exchange, Waste storage, Evaluation, Assessment.
Identifiers: Fuel rods, Spent fuel.

Spent fuel from nuclear reactors is stored underwater at the Idaho Chemical Processing Plant for cooling and shielding before processing. The fuel storage basin water becomes contaminated with fission products, primarily cesium 137 and strontium 90, from fuel elements that 'leak' and from cut pieces of fuel and miscellaneous scrap contained in cans, which are vented to release gases. Laboratory research and plant-scale tests are described of candidate ion-exchange materials for removing cesium 137 and strontium 90 from the contaminated storage basin water, which contains moderate quantities of nonradioactive dissolved solids. Cesium 137 is removed by a zeolitic ion-exchange material; strontium 90 is removed by an organic ion-exchange resin. Operational experience with plant-size ion-exchange columns indicate that both cesium 137 and strontium 90 are removed effectively by ion exchange. (Houser-ORNL)
W75-08667

NUCLEAR WASTE MANAGEMENT AND TRANSPORTATION QUARTERLY PROGRESS REPORT JULY-SEPTEMBER, 1974.
Battelle-Pacific Northwest Labs., Richland, Wash. Nuclear Waste Technology Dept.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No BNWL-1876, $5.45 in paper copy $2.25 in microfiche. Rept No BNWL-1876, November 1974. 92 p, 28 fig, 12 tab.

Descriptors: *Management, *Waste disposal, *Radioactive waste disposal, *Waste treatment, Waste storage, Transportation, Monitoring, Assessment, Safety, Evaluation, Analytical techniques, Tritium, Separation analysis, Facilities.
Identifiers: *Actinides.

Reported are studies of methods for waste management and disposal of radioactive wastes. Included are separation techniques of actinide elements and tritium, waste treatment and handling, characterization of ground burial, and disposition of retired facilities. (Houser-ORNL)
W75-08668

STORMWATER CONTROL KEY TO BAY POLLUTION SOLUTION.
Engineering News-Record, Vol 193, No 25, p 17-18, December 12, 1974. 4 fig.

Descriptors: *Combined sewers, *Storm runoff, *Flooding, *Overflow, Sewers, Treatment facilities, Computers, Effluents, Planning, Costs, *Waste water treatment, Tunnels, Flood control, *California.

Identifiers: *Retention basins, *San Francisco(Calif).

A thirty-year master plan for the San Francisco Bay Area for collection and treatment works has been designed. The San Francisco system combines both sanitary sewage and stormwater, and each year an estimated six billion gallons of waste water escape treatment during storms. Out of $700 million allotted for the 30-year project, about $500 million would go for stormwater control. The total plan calls for over forty retention basins capable of holding up to 7 million cu ft of overflow for subsequent treatment. These basins will counteract uneven patterns of flooding and pollutant loading that are caused by Pacific storms. Severe storms increase dry weather flow more than ten times. A computer system would control basin gates to match flow from the basins with treatment capacity. The overall plan aims at reducing the number of overflows by 90%. It includes: a new 1000 mgd treatment plant near Lake Merced to provide split-flow treatment (250 mgd of secondary capacity and 750 mgd for primary capacity) for stormwater; a five mile long dual conduit ocean outfall to discharge wet weather effluent 8000 ft offshore from the Lake Merced plant; and a tunnel of up to 32 ft in diameter to move sewage eight miles across town. Problems on the San Francisco side of the Bay involve buying public lands and receiving sufficient Federal funding. (Prague-FIRL) W75-08671

HURRICANE SPURS SEWER RENOVATION.
Water and Wastes Engineering, Vol 11, No 10, p 14, October, 1974.

Descriptors: *Sewers, *Floods, Drainage, Repairing, Data, Flood damage, Planning, Cleaning, Manholes, Installation, *Pennsylvania.
Identifiers: *Wilkes-Barre(Penn), *Hurricane Agnes, *Closed-circuit television inspection.

Under the auspices of the Wilkes-Barre Redevelopment Authority, the city of Wilkes-Barre, Pennsylvania is as well as reevaluating renovating its sanitary and storm sewage system. Cleaning, closed-circuit television inspection, and repair of existing sewers were done in the South Wilkes-Barre disaster urban renewal project area. As a result of data gathered by the southern Line Cleaning of Casselberry, Florida, a new, updated drainage system for South Wilkes-Barre will be plotted. This is part of an overall $11 million public improvements program to serve the residential area for several decades. The closed-circuit television inspection of existing sewer lines will allow for the inspection of conditions with the highest degree of accuracy possible. These planned programs will result in the first cleaning of existing lines since the flooding caused by Hurricane Agnes in 1972. In cases where crushed lines and non-existent manholes prohibit working on a particular length of line, reconstruction of these collapsed lines and installation of manholes will take place. (Prague-FIRL) W75-08672

PUMPS FOR POLLUTION CONTROL,
J. A. Edwards.
Pollution Engineering, Vol 6, No 11, p 26-35, November, 1974. 33 fig.

Descriptors: *Pumps, *Construction materials, *Design criteria, *Centrifugal pumps, Centrifugation, Waste treatment, Sludge treatment, Costs, *Waste water treatment, Water pollution control.

Design and construction materials for over thirty waste treatment pumps are described. These include the centrifugal pump used for transferring solutions between reaction tanks, the proportioning pump for accurate control of chemical addition, the diaphragm pump for slurries, the screw pump for high viscosity solutions and the gear pump for hydraulic systems. Criteria for choosing the proper pump for a system are detailed. Factors to be considered in selecting a centrifugal pump are total discharge head, net positive suction head, motor RPM, seal design, equipment location, construction materials, solution temperature, and equipment application. A pump may use a packed stuffing box seal or a mechanical seal or may be designed to use no seal at all. Impeller design is usually related to size of housing and type of liquids or solids pumped; impellers described include open and semi-enclosed impellers and shrouded impellers. Sludge handling pumps in pollution control systems are also discussed. Two distinct varieties are the progressive cavity pump and the diaphragm pump. Pump designs may be single-stage, multi-stage, turbine, diaphragm, in-line or vertical and horizontal centrifugal. Each type fills a specific need, and should be chosen by factors of efficiency and economy. (Prague-FIRL) W75-08674

NEWPORT--MAIN DRAINAGE SCHEME TAKES SHAPE,
P. Millbank.
Civil Engineering, p 24-25, 38 December, 1974. 2 fig.

Descriptors: *Rivers, *Water pollution control, *Sewerage, Sewers, Organic matter, Dissolved oxygen, Pipelines, Drainage, Water treatment, Sewage treatment, *Waste water treatment.
Identifiers: *River Usk(Newport South Wales).

The development of a scheme for pollution control on the River Usk at Newport, South Wales is described. The major part of the existing sewerage system carries both sewage water and surface water and was designed over a century ago. In 1960, control of new or altered outlets for the discharge of sewage and trade effluent came within jurisdiction of the river authorities under a Clean Rivers (Estuaries and Tidal Waters) Act. River analysis confirmed that the estuary of the Usk was heavily polluted by decomposing organic matter, that a belt of polluted water swings to and fro with the tide, and that the expected twice daily flushing of the estuary as a result of a large tidal difference of 40 feet does not occur. It was recommended that sewage be discharged into the river below the town of Newport after partial treatment; it was estimated that this would keep the dissolved oxygen in the river over 50%, contrasted with the 30% or less that it had been. Work was begun on a large trunk sewer on each side of the river, to carry up to six times the dwf drawn from existing outfall pipelines. Local relief sewers were proposed to alleviate drainage in problem areas. A final three-stage proposal included stage one as an internal drainage works and a new pumping station, design for a stage two Nash treatment works and a pumping main to connect it with the Liswerry pumping station, and a stage three sewage works in the Duffryn area to be connected across the Usk to Nash. (Prague-FIRL) W75-08675

DAVENTRY SEWERAGE SCHEME COMPLETED AHEAD OF SCHEDULE.
Water Services, Vol 78, No 941, p 252, July, 1974.

Descriptors: *Construction, *Sewage treatment, Municipal wastes, Industrial wastes, Underground streams, *Treatment facilities, Tunnels, *Wastewater treatment, Waste disposal.
Identifiers: Great Britain(Daventry), Combined municipal-industrial wastes.

A new sewage disposal works at Daventry, Great Britain, has been designed to treat both industrial and domestic effluents. The works is capable of handling a population of 30,000, which is the estimate for 1980. Engineers have designed the works for 100 percent extention of capacity, with available land for even further expansion. Over eight miles of cast iron pipes, up to 30 inches in diameter, have been laid to connect sewerage purifica- tion equipment within the plant. A sludge treatment area, administration buildings, a sludge press house, two pumping stations, a land treatment area, pipework chambers, and access and site roads have been constructed. In order not to disrupt motor or rail traffic, excavation was done by a thrust boring technique. The greatest problem faced was underground water found in the tunnel section. Continuous deep well pumping during construction was necessary at three bore holes to remove 250,000 gallons per 24 hours. (Prague-FIRL) W75-08676

TOTAL URBAN WATER POLLUTION LOADS: THE IMPACT OF STORM WATER,
Enviro Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5B. W75-08677

SELF-CLEANING STORM OVERFLOW BASINS WITH MEANDER DUCT (SELBSTREINIGENDE REGENUBERLAUFBECKEN MIT SCHLANGENRINNE),
J. Koral, and C. Saatci.
Wasserwirtschaft, Vol 64, No 10, p 301-306, October, 1974. 11 fig, 4 ref.

Descriptors: *Storm water, *Storm runoff, Precipitation(Atmospheric, Construction, Planning, *Design, Pilot plants, Waste water treatment.
Identifiers: Pilot tests, *Switzerland, *Storm water tanks.

The construction of a new, self-cleaning storm water tank is described. Solids which have settled during the precipitation are removed by dry weather flow, which crosses the bottom of the tank like a meander. This reduces the work required to clean the tank. This construction has been pilot tested for six years continuously in Switzerland. The dimensions and application possibilities are detailed. Other examples are presented; specialists' opinions about possible problems with the method are given. (Prague-FIRL) W75-08679

STOCHASTIC ANALYSIS OF TRICKLING FILTER,
Texas Univ. at Austin. Dept. of Chemical Engineering.
K. J. Mistry, and D. M. Himmelblau.
Journal of the Environmental Engineering Division, ASCE, Vol 101, No EE3, Proceedings paper No 11362, p 333-350, June 1975. 5 fig, 1 tab, 19 equ, 17 ref.

Descriptors: *Water quality, *Waste water treatment, *Trickling filters, *Stochastic processes, *Environmental engineering, Design, Model studies, Simulation analysis, Monte Carlo method, Statistical methods, Flow rates, Probability, Distribution, Oxygen, Biochemical oxygen demand, Measurement, Safety factors, Equations, Mathematical models, Systems analysis, *Risks.
Identifiers: Random variables, Tolerances(Mechanics), Mass balance, Numerical values, Deterministic models, Mean, Standard deviation.

In most conventional methods of analysis and design for wastewater processes, the stochastic nature of the process inputs and parameters is ignored. Stochastic treatment of a process is more difficult than a deterministic treatment but can provide more significant information concerning the design parameters. A stochastic approach to trickling filter design is described based on a two-phase two-component model of the filter. Random variables were introduced to represent random BOD inputs and flow rates as well as uncertainty in the model coefficients. The study results demonstrate how to use a stochastic analysis as a

supplement to the usual deterministic design and to achieve a more quantitative specification of uncertainty. Indicated is under what circumstances the sample estimate of the expected value of the output of a stochastic model of a trickling filter differs from the output of the related deterministic model based on replacing the random variables by their expected values. Also, the study shows how to use the measurements of sample dispersion of the output BOD to compute safety factors for design. Although application has been to a trickling filter, the methods of stochastic analysis described herein can be applied to most other wastewater treatment apparatus. (Bell-Cornell)
W75-08720

DYNAMIC MODELING AND CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE PROCESS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering; and Environmental Dynamics, Inc., Greenville, S.C.
J. B. Busby, and J. F. Andrews.
Journal Water Pollution Control Federation, Vol 47, No 5, p 1055-1080, May 1975. 22 fig, 3 tab, 23 equ, 45 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Water quality, *Simulation analysis, Biological treatment, Wastes, Computers, Suspended solids, Systems analysis, Mathematical models, Recycling.
Identifiers: *Process control, Dynamic models, Feeding, Step-feed process, Ratio control.

Conventional activated sludge processes may be controlled by sludge recycle rate, waste sludge flow rate, and aeration rate. In a multistage reactor system such as the step-feed process, variations in wastewater feed patterns are another control technique. A wide-spectrum activated sludge process model was developed that considers the storage capability of the sludge, incorporates the active and inert fractions of the mixed liquor volatile suspended solids in separate mass balances, and in coupled with a dynamic model of the final clarifier. Control strategies investigated include various sludge wasting and recycle control techniques and hydraulic methods. Computer simulation results indicate that the model satisfactorily describes the different process versions and that dynamic variations in wastewater feed pattern are valuable for control. (Bell-Cornell)
W75-08725

MADAM I—A NUMERIC METHOD FOR DESIGN OF ADSORPTION SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Water Resources Engineering.
W. J. Weber, Jr., and J. C. Crittenden.
Journal Water Pollution Control Federation, Vol 47, No 5, p 924-940, May 1975. 11 fig, 27 equ, 20 ref.

Descriptors: *Adsorption, *Design, *Water quality control, *Waste water treatment, Mathematical models, Numerical analysis, Computers, Evaluation, Equations, Systems analysis, Treatment facilities, Separation techniques.

Considered are the development of a numeric method for adsorber design and the critical evaluation and comparison of this and other modeling techniques for adsorption processes in packed and expanded beds. The numeric model described herein is the Michigan Adsorption Design and Applications Model—I (MADAM I). It can accomodate the dynamic aspects of fluid dispersion, solids mixing, multisolute interactions, and biological growth on activated carbon surfaces. The numeric solution solves for the values of dependent variables at discrete points in the domain of the independent variables. In the case of adsorption, the solid-phase concentration is predicted at any new point in time by using prior values of solid- and liquid-phase concentrations. Then, the equations

governing liquid-phase concentrations are solved at the current time level. Breakthrough curves may be obtained by proceeding through time. Results agree well with experimental data. The method has advantages over conventional modeling techniques. The aim of the authors in constructing MADAM I has been to develop a general modeling scheme that describes the dynamics of the adsorption treatment process, provides an optimum design, and reduces costs and planning time required at both the pilot and full-scale plant levels. (Bell-Cornell)
W75-08726

GRAVITY OIL-WATER SEPARATOR WITH TWO INTERCONNECTED SINGULAR CELLS HAVING AUTOMATIC FREE OIL DISCHARGE,
R. L. Summers.
U.S. Patent No. 3,862,039, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 930, No 3, p 1332, January 21, 1975.

Descriptors: *Patents, Oily water, *Waste water treatment, Pollution abatement, Water pollution control, *Separation techniques, Equipment, Gravity, *Oil wastes, *Oil pollution.
Identifiers: Gravity separation.

A gravity separator comprises a tank assembly including side-by-side first and second tank components. The tank components are closed at their lower ends. The first tank component includes an upper inlet opening at a level below the upper end while the second tank component includes an upper outlet opening outward at a level below the upper end and horizontally aligned with the inlet of the first component. The second component includes an upstanding lift passage in closed communication with the outlet of this component which opens downward into a lower interior portion. At its lower end a transfer passage is provided which communicates with a lower portion of the interior of the first tank component. The first tank component includes an oil outlet placed slightly above the level on the inlet. As water enters the tank component it falls to the bottom and moves upward through the inlet pipe, through the transfer pipe and into the interior of the second tank component through the vertical outlet portion of the transfer pipe. Any oil remaining in the liquid flowing through the transfer pipe will be elevated and there will be substantially no oil with the liquid entering the lower end of the lift pipe for discharge from the second tank component. (Sinha-OEIS)
W75-08735

METHOD OF APPARATUS FOR TREATING SEWAGE,
Trans-Continental Purification Research and Development Ltd., North Bay (Ontario). (assignee)
A. Z. Morin, and T. H. Boyd.
U.S. Patent No. 3,864,252, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 329, February 4, 1975.

Descriptors: *Patents, *Sewage treatment, *Distillation, *Waste water treatment, Pollution abatement, Equipment, Evaporation, Septic tanks, Condensation, Water vapor, Domestic wastes, *Incineration.

The treatment of wastes such as domestic sewage is disclosed for the method of and apparatus for handling the run-off from a septic tank or other separating unit including the evaporation and/or burning of the outflow of such unit. In the case of a septic tank the solids progressively settle in a series of connected tanks where the eventual run-off is a relatively clear liquid. It is proposed to heat this fluid, discharging the water vapour to the atmosphere, and subject any combustible gases that are present to an open flame. The liquid, heated in one or more stages to a high temperatures, is preferably sprayed as steam or gaseous vapour

into an open flame to further raise the temperature of the steam and to ignite and burn off the combustibles. The steam in part may then be condensed and drained off as mainly distilled water while the remaining gaseous vapours are treated to a second open flame to burn off any residual combustile volatiles, with the products of combustion and reheated steam or water vapour being discharged to the atmosphere. (Sinha-OEIS)
W75-08738

SLIME CONTROL COMPOSITIONS AND THEIR USE,
Betz Labs., Inc., Trevose, Pa. (assignee)
B. F. Shema, R. H. Brink, Jr., and P. Swered.
U.S. Patent No. 3,864,253, 5 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 329, February 4, 1975.

Descriptors: *Patents, *Waste water treatment, Microorganisms, *Slime, Bacteria, Fungi, Algae, Pulp and paper industry, Cooling water, *Industrial water, *Pulp wastes.
Identifiers: *Chemical treatment, Aerobacter aerogens.

This invention relates to certain processes and compositions useful for inhibiting the growth of slime in water and, in particular, water used for industrial purposes; for example, in the manufacture of pulp paper, in the manufacture of paper, in cooling water systems and in effluent water treatment. The processes or mixtures show unexpected synergistic activity against microorganisms, including bacteria, fungi, and algae which produce slime in aqueous systems of bodies which are objectionable from either an operational or aesthetic point of view. Specifically, the invention is directed to the use of compositions comprising a combination of 2,2-Dibromo-3-nitrilopropionamide and Sodium linear dodecyl benzene sulfonate. (Sinha-OEIS)
W75-08739

SEWAGE TREATMENT UNIT,
Texaco Inc., New York. (assignee)
H. V. Hess, W. F. Franz, and E. L. Cole.
U.S. Patent No. 3,864,254, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 329, February 4, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Pollution abatement, Water quality control, Water pollution control, Domestic wastes, Sewage sludge, Chemical oxygen demand.
Identifiers: *Hydrogen peroxide.

A sewage treatment unit for the disposal of aqueous waste sewage from a small installation includes a primary settling zone receiving the sewage and separating raw sludge from the water. A first pump conveys the water to a storage zone and actuates a second pump which meters in hydrogen peroxide from a supply thereof into the storage zone to reduce the COD of the water. A pump forces the settled sludge to a coking zone where it is coked in the liquid phase. The coke thus formed then passes to a pressure settling device where it is separated from the coking effluent which is recycled to the storage zone. (Sinha-OEIS)
W75-08740

METHOD AND APPARATUS FOR SURFACE SKIMMING,
Ecodyne Corp., Lincolnshire, Ill. (assignee)
R. L. Shaffer.
U.S. Patent No. 3,864,257, 4 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 330, February 4, 1975.

Descriptors: *Patents, *Flotsam, *Water treatment, Water pollution control, Pollution abatement, *Skimming, Industrial wastes, *Waste water treatment, Separation techniques.
Identifiers: Clarification, Surface skimming.

A surface skimming system is provided which in its simplest form includes a rotating arm, a fixed anti-rotation arm, and an airlift pumping device. The rotating arm is mounted tangentially to a rotating stilling well or a centrally disposed shaft and positioned so that it projects above the surface of the clarifier. The anti-rotation arm is positioned so that it breaks the surface of the clarifier. The bottom portion of the anti-rotation arm is of a flexible material, such as rubber, so that it may deflect and allow the rotating arm to pass under it. The airlift is positioned under the outer periphery so that it draws water from the surface. The rotating arm sweeps the surface of the clarifier, pushing the floating matter ahead of it. As the rotating arm approaches the fixed anti-rotation arm, a 'wedge' is formed therebetween which traps the floating matter. As the rotating arm continues to rotate, the 'wedge' is made smaller and moves outward, forcing the floating matter to the airlift pump which removes it along with some water. (Sinha-OEIS) W75-08741

APPARATUS FOR TREATING SEWAGE,
RSC Industries, Inc., Opa-Locka, Fla. (assignee)
J. M. Richardson, and G. W. Reid.
U.S. Patent No. 3,864,258, 4 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 330, February 4, 1975.

Descriptors: *Patents, *Waste treatment, Pollution abatement, *Sewage treatment, Water pollution control, Equipment, Domestic wastes, Filtration, *Separation techniques.

The process of using the apparatus of this invention comprises separating the sewage solids present in an aqueous medium immediately on generation, avoiding the inclusion of liquid with solids, which is costly to treat, by accumulation as a layer on a movable porous medium through which the aqueous medium passes to a filtered liquid accumulation reservoir, then transporting the accumulated sewage solids through a thermal destruction chamber wherein the solids are converted to inert ashes and gases, discharging gases produced at temperatures sufficient to destroy odors and then withdrawing the accumulated inert ash solids. The apparatus comprises a moving porous element, a filtered liquid accumulator tank positioned below a limited area of the porous element, means for delivering sewage solids to the limited area of the porous element present above the accumulator reservoir, means for the thermal destruction of the solids by radiant heat, means for actuating the moving porous element to carry the solids through the thermal destructor and finally means for withdrawing inert ash separately from vented gases. (Sinha-OEIS) W75-08742

APPARATUS FOR THE TERTIARY TREATMENT OF LIQUIDS,
Hendrick Mfg. Co., Carbondale, Pa. (assignee)
G. Spohr, and V. R. Sparham.
U.S. Patent No. 3,864,264, 5 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 332, February 4, 1975.

Descriptors: *Patents, *Tertiary treatment, *Waste water treatment, *Waste treatment, Water quality control, Chlorine, Solid wastes, Sludges, Pollution abatement.
Identifiers: Clarifiers.

A tertiary treatment apparatus comprises a chlorine contact tank into which is compactly assembled an upflow clarifier adapted to receive water to be treated. The clarifier is equipped with a septum in the form of a single sheet or layer or metallic wires which promotes the formation of a flimsy sludge blanket above the septum. The flimsy blanket represents solids, mostly of a colloidal nature, which have escaped the secondary treatment but which, being entrapped in the blanket, are rendered accessible for removal. The ap-

paratus includes a downflow treatment means assembled in the upflow clarifier and above its septum. The downflow treatment means receive clarified water and after treatment, discharge into the chlorine contact tank. Removal of the sludge blanket before it reaches the downflow treatment means is accomplished by means of drainage devices associated with the upflow clarifier and operative, without appreciable disturbance to the progressive operation of the entire apparatus, to withdraw the liquid in above the septum so as to collapse the flimsy blanket downward through the septum and thus remove the blanket contents from the water being treated. (Sinha-OEIS) W75-08744

DIFFUSED AERATION PIPE APPARATUS FOR USE WITH AN AERATION TANK,
Nigata Engineering Co. Ltd., Tokyo (Japan). (assignee)
S. Suzuki.
U.S. Patent No. 3,864,441, 4 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 375, February 1975.

Descriptors: *Patents, *Aeration, *Piping systems(Mechanical), *Waste water treatment, *Pollution abatement, Equipment, Pipes, Water treatment.
Identifiers: *Aeration tanks.

A diffused aeration pipe apparatus for use with an aeration tank is comprised of air supply pipes pivotably connected to each other by way of swivel joints and an air diffusion pipe at the lower end of the air supply pipe system. A guide member for pulling a hoisting rope is provided along the vertical bent portion of an upper most air supply pipe for reducing the moment of rotation required for hoisting the piping system. Each adjacent two air supply pipes in the piping system have a projection piece and a projection lever engaging respectively for restricting the rotation of the two adjacent pipes within a predetermined angle. A movable carriage having an electric motor, a speed retarder for the motor, a winding up wheel pivotally connected to the power shaft of the retarder and a control panel is provided for enabling the successive hoisting and descending of the diffused aeration pipe apparatus. (Sinha-OEIS) W75-08745

PURIFICATION CONTROL UNIT,
Camper and Nicholsons Ltd., Gosport (England). (Assignee).
For primary bibliographic entry see Field 5F.
W75-08751

APPARATUS FOR REMOVAL OF DISSOLVED OR SUSPENDED SOLIDS IN WASTE WATER,
Swift and Co., Chicago, Ill. (Assignee).
H. T. Anderson.
U S Patent No 3,865,711, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 810-811, February 11, 1975.

Descriptors: *Patents, *Oil wastes, *Oil pollution, Oily water, *Water pollution treatment, *Waste water treatment, Emulsions, Electric currents, Dissolved solids, Suspended solids, Separation techniques, Hydrogen ion concentration.
Identifiers: Water-oil emulsion, Anolyte stream.

Waste water containing oil and water emulsions and dissolved or suspended solids is de-emulsified and clarified by creating a three dimensional anolyte stream resulting from the careful placement of anodes and impressing direct or galvanic current through the water. Waste water is first contacted with an anode system in a restricted zone so as to give substantially all of the waste water a rapid pH change of several units and is then conveyed to a second zone wherein a three dimensional anolyte stream is formed causing the oily particles to float to the surface of the water

where they can be skimmed off. The apparatus consists of a container having an entry conduit and an exit conduit and having a baffle across the width of the container and positioned nearer the inlet end than the discharge end thereby dividing the container into an inlet zone and a discharge zone. The lower section of the baffle is parallel to the inlet end and the upper section of the baffle is inclined toward the discharge end of the container. Cylindrical anodes in the inlet zone are spaced transverse to the longitudinal axis of the container, and cylindrical anodes in the discharge zone are spaced parallel to the longitudinal axis of the container at about nearly equal distance apart in the discharge zone. (Sinha-OEIS) W75-08752

AERATORS WITH DE-ICING MEANS,
For primary bibliographic entry see Field 5G.
W75-08755

SYSTEM FOR SEPARATING HYDROCARBONS FROM WATER,
Fram Corp., East Providence, R.I. (Assignee).
For primary bibliographic entry see Field 5G.
W75-08757

CONTAMINATED WATER TREATING APPARATUS,
T. Mochizuki, and K. Kawada.
U S Patent No 3,878,097, 5 p, 12 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 3, p 1341, April 15, 1975.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Biological treatment, *Oxidation, *Sewage treatment, Industrial wastes, Water quality control, Equipment.

An apparatus for biologically improving the quality of contaminated water comprises of at least three side by side oxidation compartments spaced at intervals from each other and each being open at the top and bottom. The compartments have end walls vertically extending aeration compartments. Aeration means at the lower end of each aeration compartment feeds a flow of air into the bottom of the aeration compartments for lifting contaminated water up through the aeration compartments and over the upper ends of the compartment walls. Partitions extend upward to the bottoms of the biological oxidation sections in each oxidation compartment which lies between two aeration compartments to define sludge collection compartments beneath each aeration compartment and a portion of the oxidation compartment. An overflow passage extends upward from the sludge collection compartment. Contaminated water is introduced and circulated through the biological oxidation section repeatedly until purity of the water is improved. (Sinha-OEIS) W75-08758

SEWAGE TREATMENT APPARATUS,
S. R. Kennedy.
U S Patent No 3,878,101, 6 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 3, p 1342, April 15, 1975.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, *Waste water treatment, Water quality control, *Aeration, Equipment, Weirs, Skimming, Sludge.

The sewage treatment apparatus comprises a primary liquid circulation chamber in which sewage is circulated around a curved circulation guide barrier that shields an outlet port. The sewage circulates due to the introduction of pressurized air in the chamber liquid. The air is directed along a predetermined path thereby influencing liquid circulation. The circulation guide barrier extends between opposite walls of the primary chamber to prevent the liquid from crossing over the barrier to

the outlet port. An entry opening is provided in the barrier leading to the outlet port to ensure that liquid passes into the outlet port along a predetermined path. The outlet port is located substantially central of the circulating liquid, and sludge that is present in the liquid tends to move radially away from the outlet port. Liquid entering the outlet port is thus rendered substantially free of sludge. The radially moving sludge tends to sink to the bottom of the primary circulation chamber and is drawn our by suction apparatus placed at the bottom of the chamber. The collection chamberfpools the circulated liquid from a second circulation chamber and includes weirs for skimming the surface layer of the pooled water. (Sinha-OEIS)
W75-08759

THE PROTECTION OF THE QUALITY OF WATERS, AN IMPORTANT ELEMENT IN THE CONSERVATION OF NATURE, (IN ROMANIAN),
Consililul National al Apelor, Bucharest (Rumania).
For primary bibliographic entry see Field 5G.
W75-08775

DESIGN OF COOLING TOWER RETURN CHANNEL FOR TVA'S BROWNS FERRY NUCLEAR PLANT,
Tennessee Valley Authority, Norris. Engineering Lab.
S-T. Hsu, and R. A. Elder.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 179-187, 1973. 7 fig, 2 ref.

Descriptors: Structures, *Model studies, *Flow control, *Nuclear powerplants, *Cooling towers, Water cooling, Heated water, Outlet works, Channels, Gates, Hydraulic gates, Gate control, Engineering structures, Hydraulic models, Hydraulic structures, Spillways, Spillway gates, Tennessee Valley Authority, *Thermal pollution, *Waste water treatment.

TVA's Browns Ferry Nuclear Plant is located on the Tennessee River about 12 miles northwest of Decatur in northern Alabama. A diffuser-pipe system was orginally designed for purposes of heat dissipation. The design of this diffuser-pipe system satisfied the water temperature standards proposed by Alabama for compliance with the Water Quality Act of 1965. These criteria, however, were revised after December 1971. To comply with the new criteria, TVA is building six mechanical-draft cooling towers to supplement the diffuser pipes. There will be three possible modes of operation for the combined cooling tower-diffuser pipe system: (1)open-mode cooling using the diffuser pipes, (2)closed-mode cooling using the cooling towers, and (3) helper-mode cooling using the towers and the pipes in series. In order to achieve the three modes of operation, three structures were designed to control the flow in the return channel. Model studies and transient computations were conducted to ensure proper performance of the return channel and the three associated structures. The hydraulic problems associated with the designs originally proposed and the modifications found necessary for optimal use were described. The results of these studies showed the effect of vortex formation on the headloss due to Gate Structure No. 1, the importance of conducting hydraulic transient computations in the design of Gate Structure No. 2, and the flow characteristics downstream from Gate Structure No. 2 and Discharge Control Structure prior to and after installations of the floor structures in the stilling basins. (See also W75-08786) (Sims-ISWS)
W75-08803

TRANSIENT COOLING POND BEHAVIOR,
Oak Ridge National Lab., Tenn.
P. J. Ryan, and D. R. F. Harleman.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 191-201, 1973. 7 fig, 1 tab, 5 ref.

Descriptors: *Ponds, *Cooling water, *Powerplants, Model studies, Mathematical models, Laboratory tests, Unsteady flow, Skimming, Temperature, Heat transfer, Winds, Behavior, *Thermal pollution, *Waste water treatment.
Identifiers: *Cooling ponds, Skimmer walls, Transient response.

An analytical and experimental study of transient cooling pond behavior was conducted. The characteristics of an efficient type of cooling pond were defined, and the performance of this type of pond was examined in the laboratory. A new expression for surface heat loss from an artificially heated water surface was developed and tested in the field and the laboratory. The expression explicitly includes the effect of free (buoyancy driven) convection. The effects of entrance mixing and density currents on cooling pond performance were studies. A predictive mathematical model, which incorporates transient temperature variations in both the horizontal and vertical planes, was developed and tested against data from a laboratory cooling pond and against five years of data from two different types of field cooling ponds. (See also W75-08786) (Sims-ISWS)
W75-08804

WATER POLLUTION CONTROL BY HYDRAULIC AERATION,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W75-08814

CHARACTERISTICS OF AN AIR-WATER MIXTURE IN A VERTICAL SHAFT,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08815

WASTEWATER RECLAMATION AND RECHARGE, BAY PARK, N.Y.,
Geological Survey, Mineola, N.Y.
J. Vecchioli, J. A. Oliva, S. E. Ragone, and H. F. H. Ku.
ASCE Proceedings, Journal of the Environmental Engineering Division, Vol 101, No EE2, Paper 11232, p 201-214, April 1975. 9 fig, 4 tab, 21 ref.

Descriptors: *Water reuse, *Reclaimed water, *Artificial recharge, *Injection wells, *New York, Tertiary treatment, Water quality, Groundwater.
Identifiers: *Long Island(NY).

A water-conservation method currently under study by Nassau County, New York, involves reclamation of wastewater and its return to the groundwater reservoir. Since 1968, the Nassau County Department of Public Works has operated an advanced waste-treatment plant at Bay Park, N.Y., near the south shore of Nassau County. Reclaimed water from this plant has been used in a series of deep-well artificial-recharge experiments. About 600,000 gal/day of effluent from an activated-sludge sewage treatment plant was further purified by clarification, filtration, activated-carbon adsorption, and chlorination. Significant quality parameters of the reclaimed water and their usual concentrations were: Chemical oxygen demand approx. 10 mg/litre; phosphorus approx. 0.1 mg/litre, methylene blue active substances <0.1 mg/litre, and turbidity <1 mg/litre.

Reclaimed water was injected intermittently in a series of tests into the Magothy aquifer through a well screened at a depth of 418 ft to 480 ft below land surface. The rate of excessive head buildup observed during the recharge of 41,700,000 gal averaged 3 ft per 1,000,000 gal. Operation and maintenance costs (1972) of further purifying the secondary-stage effluent to rechargeable quality, but without nitrogen removal, are estimated to be about $0.27 per 1,000 gal on a 3-mgd scale. (Knapp-USGS)
W75-08827

THE IMPACT OF WATER QUALITY OBJECTIVES ON URBAN WATER SUPPLY PLANNING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. R. Walker, and G. V. Skogerboe.
Water Resources Bulletin, American Water Resources Association, Vol 9, No 5, p 861-873, October 1973. 6 fig, 1 tab, 5 ref. OWRR B-071-COLO(6).

Descriptors: *Municipal water, *Water supply, *Water quality, *Management, *Alternative planning, *Water reuse, *Waste water treatment, Optimization, Costs, Algorithms, Operation and maintenance, Construction costs, Dissolved solids, Biochemical oxygen demand, Activated sludge, Electrodialysis, Equations, Mathematical models, Operations research, Constraints, Colorado.
Identifiers: *Urban effluent, *Cost minimization, Nonlinear programming, Denver(Colo).

Economically optimum policies for supplying rapidly expanding urban centers with additional water supplies are shown to be dependent on water quality goals for the urban effluent. A nonlinear elimination algorithm has been developed and applied to the wastewater treatment system of a typical urban water supply network to delineate minimum-cost treatment procedures under a wide variety of effluent standards. To define the feasibility of new water sources as opposed to reuse, a comparison of costs with and without various levels of reuse are made, and unit costs of water under these conditions are determined. Data from the Denver metropolitan area are used to derive cost information. It is shown that as effluents are required to meet increasingly higher standards, the unit costs associated with wastewater treatment system capacity expansion for water recycling decrease substantially. The model considers primary, secondary (activated sludge), and tertiary treatment, as well as desalting (electrodialysis). The water quality vector is limited to the inorganic concentration of total dissolved solids and the five-day Biochemical Oxygen Demand concentration. (Bell-Cornell)
W75-08845

5E. Ultimate Disposal Of Wastes

TREATMENT AND DISPOSAL OF WASTEWATER SLUDGES,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-08552

WASTE TREATMENT AND HANDLING PROCESSES ANNUAL REPORT,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-08641

DEMOLITION OF BUILDING 12, AN OLD PLUTONIUM FILTER FACILITY,
Los Alamos Scientific Lab., N. Mex.
E. L. Christensen, R. Garde, and A. M. Valentine.

Available from the National Technical Information Service, Springfield, Va 22161 as Rept No LA-5755, $4.00 in paper copy, $2.25 in microfiche. Rept No LA-5755, January 1975. 20 p, 38 fig, 5 tab.

Descriptors: *Radioactive waste disposal, *Plutonium, *Environmental effects, *Filters, *Facilities, Air pollution, Soil contamination, Water pollution, Public health, Safety, Evaluation, Transportation, Comprehensive planning, Alternative planning, Engineering, Monitoring, Air, Soils, Sampling.
Identifiers: *Demolition, *Decontamination.

The decommissioning and disposal of a plutonium-contaminated air filter facility that provided ventilation for the main plutonium processing plant at Los Alamos from 1945 until 1973 are described. The health physics, waste management, and environmental aspects of the demolition are also discussed. (Houser-ORNL)
W75-08643

TRANSURANIC SOLID WASTE MANAGEMENT RESEARCH PROGRAMS, PROGRESS REPORT FOR APRIL-JUNE, 1974.
Los Alamos Scientific Lab., N. Mex. Health Div.
For primary bibliographic entry see Field 5D.
W75-08647

DEEP ROCK NUCLEAR WASTE DISPOSAL TEST: DESIGN AND OPERATION,
Sandia Labs., Albuquerque, N. Mex.
R. D. Klett.
Available from the National Technical Information Service, Springfield, Va. 22161, as Rept No SAND 74-0042, $5.45 in paper copy, $2.25 in microfiche. Rept No SAND 74-0042, September 1974. 144 p, 57 fig, 9 tab, 38 ref.

Descriptors: *Radioactive waste disposal, *Liquid, *Nuclear waste, *Model studies, *Research and development, *Geological formations, *Bedrock, Granites, Design criteria, Operations, Simulation analysis, Feasibility.

An electrically heated test of nuclear waste simulant in granitic rock was conducted to demonstrate the feasibility of the concept of deep rock nuclear waste disposal and to obtain design data. The deep rock disposal systems study and the design and operation of the first concept feasibility test are described. (Houser-ORNL)
W75-08656

REPORT TO CONGRESS - DISPOSAL OF HAZARDOUS WASTES.
Environmental Protection Agency Programs. Washington, D.C. Office of Solid Waste Management.
For primary bibliographic entry see Field 5D.
W75-08666

REMOVAL OF CESIUM AND STRONTIUM FROM FUEL STORAGE BASIN WATER,
Allied Chemical Corporation, Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
For primary bibliographic entry see Field 5D.
W75-08667

NUCLEAR WASTE MANAGEMENT AND TRANSPORTATION QUARTERLY PROGRESS REPORT JULY-SEPTEMBER, 1974.
Battelle-Pacific Northwest Labs., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W75-08668

DAVENTRY SEWERAGE SCHEME COMPLETED AHEAD OF SCHEDULE.
For primary bibliographic entry see Field 5D.
W75-08676

DREDGED SPOIL DISPOSAL ON THE NEW JERSEY WETLANDS: THE PROBLEM OF ENVIRONMENTAL IMPACT ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N.J. Marine Science Center.
For primary bibliographic entry see Field 5C.
W75-08716

ECONOMIC AND ENVIRONMENTAL EVALUATION OF NUCLEAR WASTE DISPOSAL BY UNDERGROUND IN SITU MELTING,
California Univ., Livermore. Lawrence Livermore Lab.
J. J. Cohen, R. L. Braun, L. L. Schwartz, and H. A. Tewes.
Available from the National Technical Information Service, Springfield, Va. 22161 as UCRL-51713. $4.00 in paper copy, $2.25 in microfiche. UCRL-51713, (TID-4500 UC-11) November 1974. 14 p, 6 fig, 2 tab, 19 ref. AEC W-7405-Eng-48.

Descriptors: *Ultimate disposal, *Radioactive waste disposal, *Nuclear wastes, *Cost-benefit analysis, Rock excavation, Waste treatment, Underground waste disposal, Liquid wastes.
Identifiers: *Underground melting, Nuclear fuel reprocessing wastes, DUMP.

A Deep Underground Melt Process (DUMP) for the management of high level nuclear waste is reviewed and evaluated relative to other proposed waste management methods. The concept calls for direct placement of liquid radioactive waste from fuel reprocessing operations deep underground into rubble-filled void spaces. The process consists of the following general phases: waste and water addition to the void space--less than 1 month; self boiling period--1 month through 25 years; rubble, followed by surrounding rock melts--25 through 90 years; and rock begins to resolidify--after 90 years. The heat from the radioactive decay melts rock in situ deep underground and an insoluble rock matrix eventually encapsulates the nuclear waste. The advantages of DUMP are elimination or reduction of many interim processes (and their associated risks) considered necessary with methods of disposal involving transportation; its applicability to all levels of liquid waste; and the permanent elimination of the waste from the biosphere. These advantages weigh favorably against AEC regulations requiring retrievability of wastes and storage at a single site. While the implementation of DUMP does not provide a significantly lesser health hazard than other proposed disposal methods, the resultant economic savings could be up to 80%. (Becker-Wisconsin)
W75-08785

5F. Water Treatment and Quality Alteration

FORMATION OF HALOGENATED ORGANICS BY CHLORINATION OF WATER SUPPLIES,
Harvard Univ., Cambridge, Mass. Dept. of Sanitary Engineering.
J. C. Morris.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 511, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Washington, DC, Report EPA-600/1-75-002, March 1975. 54 p, 166 ref. 1CA046 (PEMP), P5-01-1805-J.

Descriptors: Toxicity, Activated carbon, *Chlorination, Aeration, Catalysis, Chemical reactions, Coagulation, *Water treatment, *Water supply, *Reviews, *Waste water treatment, *Organic compounds, Phenols.
Identifiers: *Halogenated organic compounds, Chloroform, Acetones, Enolacetone.

Literature on the formation of halogenated organic compounds during the chlorination of water supplies has been reviewed critically. Types of organic compounds likely to be encountered in natural waters have been surveyed and various known or prospective reactions of dilute aqueous chlorine with these types of compounds have been discussed. Two principal types of chlorination reaction are expected: (1) electrophilic aromatic chlorination as in the long-known formation of chlorophenols; and (2) electrophilic chlorine addition to activated double bonds like that of enolacetone. Chloroform or other haloforms may occur as end products of exhaustive chlorination in either case. General substitution reactions of chlorine are unlikely however. So carbon tetrachloride or fully chlorinated higher hydrocarbons are not probable products of water chlorination. Possible methods for minimizing the concentrations of halogenated organic compounds in municipal supplies have been outlined. These include pretreatment methods, such as coagulation or preozonation to reduce amounts of precursors to the halogenated compounds, and posttreatment methods, such as carbon adsorption or aeration to remove halogenated compounds after their formation. (EPA)
W75-08357

WATER VOL. 39. A YEARBOOK FOR HYDROCHEMISTRY AND WATER PURIFICATION TECHNIQUE,
W. Husmann.
Symposium, Marburg, W Germany, 1972. Verlag Chemie GMBH: Weinheim/Bergstr, W Germany. 1972. 393 p, Illus. Pr DM 68.

Descriptors: *Water purification, *Chemicals, Water pollution, Potable water, Waste water(Pollution), Water treatment, *Water pollution sources, *Chemical wastes, *Water management(Applied), *Water quality control, Conferences.
Identifiers: *Hydrochemistry.

This book contains contributed papers on hydrochemistry, covering water pollution and drinking water treatment, waste water problems in the chemical industry and modern procedures for water treatment in power plants. The 1st group of papers includes the following specific topics: simultaneous continuous determination of the chemical O2 requirement and organic carbon; physiochemical data and testing possibilities for using polyphosphates in water; purification and disinfection processes in treatment of swimming pool water; and technical measures against eutrophication of surface waters in Germany. The next group of papers includes the following specific topics: identification of pollutants which are not readily biodegradable; studies on the mechanism of flocculation by polyelectrolytes; studies on the behavior of trace elements in treatment of drinking water; and recent aspects of water and sewage treatment. The next group of papers covers the following specific topics: test of purification of production waste water from the chemical industry; measures for the purification of petrochemical waste waters; the methylation of mercury; and experiences with waste water from chemical and physical institutes. The final group of papers covers the following specific subjects: bases for the valuation of sewage taxes dependent upon the amount of pollutants; procedure for the maintenance of water purity in the water system of power stations; perspectives in condensate treatment; and operating experiences with continuous ion exchange plants. Numerous graphs, diagrams and other illustrations are included throughout, and each paper ends with a pertinent list of references. (See also W72-08483)--Copyright 1973, Biological Abstracts, Inc.
W75-08390

DISTRIBUTION, CULTIVATION AND CHEMICAL DESTRUCTION OF GALLIONELLA FROM ALABAMA GROUND WATER,
Alabama Univ., University. Dept. of Microbiology.

For primary bibliographic entry see Field 5B.
W75-08479

WATER REUSE: RESOURCE OF THE FU-TURE,
Dallas Water Utilities Dept., Tex.
For primary bibliographic entry see Field 5D.
W75-08537

ZETA-POTENTIAL CONTROL FOR ALUM COAGULATION,
Fertilizer Corp. of India, Sindri.
V. S. Gupta, S. K. Bhattacharjya, and B. K. Dutta.
Journal American Works Association, Vol 67, No 1, p 21-23, January 1975. 13 fig, 5 ref.

Descriptors: *Montomorillonite, *Kaolinite, *Zeta potential, Surface waters, Aluminum, Sulfates, *Coagulation, Chemical reactions, *Water treatment, Chemical precipitation, Clays, Clay minerals, Inorganic compounds, Hydrogen ion concentration, Cation exchange, Water quality, Suspended solids, Flocculation, Water properties, Water purification.
Identifiers: *Fuller's earth, Isoelectric point.

The zeta potential of different clays such as kaolinite, montomorillonite, and fuller's earth at 100, 250, 500, and 1000 mg/liter in 0.0000145, 0.000058, 0.000145, and 0.00058 molar aluminum sulfate at various pH was studied and compared with results for a surface water. The clays were selected on the basis of cation exchange capacity. The results are discussed with respect to the isoelectric point as an indicant for achieving optimum destabilization with an economically efficient coagulant dose. (Witt-IPC)
W75-08565

AUTOMATION OF FILTERS IN PURIFYING DEVICES IN WATER PIPES (AVTOMATIZATSIYA FIL'TROV NA VODOPRO'/ODNYKH OCHISTNYKH SOORUZHENIYAKH),
V. B. Shimkovich.
Vodosnabzheniye i Sanitarnaya Tekhnika, No 4, p 9-11, 1974. 2 fig, 4 ref.

Descriptors: *Filters, *Automation, Hydraulics, Flow rates, Water purification, Filtration, Turbidity, Equipment, Pipes, Valves, Water treatment.
Identifiers: *Water pipes, Rotary valves.

Automatic control systems for water filters in municipal and industrial water ply systems are critically reviewed. The rates of filtration are controlled primarily by the water levels or by the flow rates of the filtrates, by means of electric or hydraulic, and sometimes pneumatic automatic control systems. The automatic control systems act upon electrically or hydraulically powered sluice valves. Poor hydraulic characteristics of of conventional sluice valves make their replacement by rotary valves necessary. The automatic sequential switchover of the filters to flushing is possible by a pulse from a limit switch. Switchover is a function of the limit value of the pressure loss, and a function of the turbidity which is controlled by a turbidimeter. (Takacs-FIRL)
W75-08572

FOUR-MEDIA FILTER,
Neptune Microfloc, Inc., Corvallis, Oreg. (Assignee).
For primary bibliographic entry see Field 5D.
W75-08632

MULTI-TANK ION EXCHANGE WATER TREATMENT SYSTEM,
Rock Valley Water Conditioning, Inc., Rockford, Ill. (Assignee).
C. H. Yocum.

U S Patent No 3,876,539, 6 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 832, April 8, 1975.

Descriptors: *Patents, *Water treatment, *Ion exchange, Water pollution control, Pollution abatement, Treatment facilities, Equipment, Waste water treatment.

The general aim is to interconnect exchangers with unique and relatively simple means for taking exchanger out of service when the exchanger begins its regenerating cycle, for keeping the exchanger out of service and in a standby status after the exchanger completes its regenerating cycle, and for bringing the standby exchanger back into service when another exchanger begins its regenerating cycle. A novel interconnecting means enables construction of the exchangers as virtually identical modular units and enables a given exchanger to be used interchangeably in treatment systems equipped with two, three or even more exchangers. Hydraulic interconnecting means switch a newly regenerating exchanger out of service and a standby exchanger into service in response to the initial flow of liquid through the drain line of the newly regenerating exchanger. (Sinha-OEIS)
W75-08637

EFFECT OF INDIVIDUAL FACTORS ON THE FORMATION OF WATER QUALITY OF THE KARA KUM CANAL AS A WATER SUPPLY SOURCE OF THE TURKMEN SSR, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W75-08644

CHARACTERISTICS OF THE ORGANIZATION OF SANITARY CONTROL OF WATER SUPPLY SOURCES AND DRINKING WATER QUALITY IN THE OIL AND GAS-BEARING REGIONS IN THE NORTHERN OBTERRITORY, (IN RUSSIAN),
Tyumenskii Gosudarstvennyi Meditsinskii Institut (USSR).
V. I. D'yachkov.
Gig Sanit. 38(9): 88-89. 1973.

Descriptors: *Water quality control, *Potable water, *Public health, Water quality, Pathogenic bacteria, Arctic regions, Water treatment, *Water supply.
Identifiers: *USSR(Ob River).

An important social factor influencing man's adaptation to the rigorous natural and climatic conditions of the northern region of the Ob river (USSR) for the purpose of developing and exploiting oil deposits is the organization of an industrial and drinking water supply. The local characteristics of the region with reference to sanitary control of water sources and quality of drinking water (with reference to microbial pathogens) and the duties of sanitary and epidemiological stations in protecting these sources are discussed.--Copyright 1975, Biological Abstracts, Inc.
W75-08681

METHOD AND APPARATUS FOR SURFACE SKIMMING,
Ecodyne Corp., Lincolnshire, Ill. (assignee)
For primary bibliographic entry see Field 5D.
W75-08741

PURIFICATION CONTROL UNIT,
Camper and Nicholsons Ltd., Gosport (England). (Assignee).
R. J. Phipps.
U S Patent No 3, 865,710, 5 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 810, February 11, 1975.

Descriptors: *Patents, *Water purification, *Water treatment, Polarity, Coagulation, Swimming pools, *Control systems.
Identifiers: *Electronic control circuit, Multivibrator circuit.

A water purification control circuit has a pair of supply terminals; first and second pairs of unidirectional output terminals; a network including controlled rectifiers and interconnecting the supply and output terminals for supplying to the first and second pairs of output terminals purification and coagulation currents respectively; a multivibrator circuit connected with the network; and a circuit controlling the operation of the multivibrator circuit. The arrangement is such that a change in state of the multivibrator circuit changed the conducting state of the controlled rectifiers to reverse the polarity of both pairs of the output terminals. (Sinha-OEIS)
W75-08751

DISTURBANCE OF WATER SUPPLY DUE TO SECONDARY BIOLOGICAL CONTAMINANTS, (IN RUSSIA),
Institutul de Sanatate Publica si Cercetare Medicale, Iasi (Rumania).
For primary bibliographic entry see Field 5C.
W75-08773

QUALITY OF PUBLIC WATER SUPPLIES OF NEW YORK, MAY 1972-MAY 1973.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5A.
W75-08832

5G. Water Quality Control

WATERSHED ORGANIZATIONS - IMPACT ON WATER QUALITY MANAGEMENT, AN ANALYSIS OF SELECTED MICHIGAN WATERSHED COUNCILS,
Michigan State Univ., East Lansing. Dept. of Resources Development.
E. Dersch, and E. Hood.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 298, $9.50 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, (May 1975), 329 p, 47 fig, 25 tab, 285 ref. OWRT A-069-MICH(1), 14-31-0001-4022.

Descriptors: *Watershed management, *Organizations, Water quality, *Water quality control, *Management, *Legislation, *Michigan, Watersheds(Basins), Planning, Model studies, Institutional constraints, Local governments.
Identifiers: *Watershed councils(Mich).

Utilizing a case study approach, eight Michigan Watershed Councils were evaluated to determine the degree to which they could have an effective impact on planning for water quality management within constraints imposed by existing state legislation. Methods chosen to measure the extent and type of this impact included first the development of a weighted index of effectiveness. Models established from this index were tested against organization operation, as revealed through council records and activities and through results of questionnaires and interviews of key individuals, representatives and government officials associated with the individual councils. Results of this procedure revealed watershed councils have, in varying degrees, contributed to water quality management planning through their advisory, planning and information-education functions. The variation was traced largely to problems associated with statutory weaknesses and deficiencies as well as structural and operational difficulties concerning internal organization, orientation and approach. Recommendations developed focused on more complete application of current

statutory responsibilities and opportunities and on more frequent contact, interaction and role-sharing with state agencies and local government units. W75-08354

THE POLLUTION ENVIRONMENT,
Utah State Univ., Logan.
J. M. Neuhold.
In: Energy, Environment and Water Resources, Proceedings of Universities Council on Water Resources Meeting, July 28-31, 1974, Logan, Utah. p 341-343, (1974).

Descriptors: *Environmental effects, *Water pollution, *Colorado River basin, *Energy, *Water shortage, Air pollution, Thermal pollution, Power plants, Saline soils, Saline water, Irrigation, Arizona, Colorado, Utah, New Mexico, Wyoming, California, Nevada, Mexico, Land use, Water utilization, Planning, *Regional analysis.

The Colorado River Basin is characterized by light rainfall and surface water scarcity. White civilization over the past century has lowered both the amount and the quality of available water. Development of energy resources will constitute yet another impact on an overtaxed, increasingly saline water supply. Oil shale and coal exploitation could be major contributors to the dewatering of the basin. Pressure to increase food supplies will accentuate the current salinity problems of agriculture. A land use/water use planning function is called for on a regional basis. Limits have to be set in terms of population increases and in terms of industrial and resource development within the region so that the resources of the region can be maintained not only for the regional population but for the nation at large. (Bowden-Arizona)
W75-08371

A MODEL FOR ESTIMATING DESIRED LEVELS OF NITRATE-N CONCENTRATION IN COTTON PETIOLES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3F.
W75-08396

AN EXAMINATION OF THE CONCENTRATION OF ORGANIC COMPONENTS WATER-EXTRACTED FROM PETROLEUM PRODUCTS,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5A.
W75-08454

THE EFFECT OF WEATHERING ON A CRUDE OIL RESIDUE EXPOSED AT SEA,
University Coll. of North Wales, Bangor. Dept. of Marine Biology.
For primary bibliographic entry see Field 5B.
W75-08457

OIL SPILL PROTECTION IN THE BALTIC SEA,
Institute for Water and Air Pollution Research, Stockholm (Sweden). Project on Ecological Effects of Oil Pollution in the Baltic Sea.
L. Ladner, and A. Hagstrom.
Journal Water Pollution Control Federation, Vol 47, No 4, p 796-809, April 1975. 7 fig, 4 tab, 23 ref.

Descriptors: *Oil spills, *Legislation, *Research and development, Oil pollution, Water pollution control, Water pollution effects, Toxicity, Toxins, Microbial degradation, Pollutant identification, Analytical techniques, Water pollution sources.
Identifiers: *Baltic Sea, Sweden.

Pursuant to an agreement among Baltic Sea countries, Sweden has enacted strict legislation regarding the discharge of oil into its territorial waters

and instituted a new control system. However, accidental or illegal discharges from tankers in the Baltic is still unacceptably high. A program to combat such spills was undertaken and is partially complete, and an oil spill research group was formed by the Swedish Coast Guard, the National Environmental Protection Board, the Swedish Petroleum Institute, and the Water and Air Pollution Research Laboratory. During the first few years of existence, the research group carried out in detail the following studies: (1) determination of the acute toxicity in brackish water of different oil dispersants, oils, and combinations of both, as well as identification of most toxic components in oils; (2) studies on composite effects of oil spills on faunal communities in the littoral zone of the Baltic; (3) studies on transformation and eventual decomposition of an oil spill as a result of microbial activity; and (4) development of analytical procedures for oil analysis, which are more relevant from an ecological point of view than traditional analytical methods are. Progress on these studies was reported. (Sims-ISWS)
W75-08464

NITRATE AND NITRITE REDUCTION IN FLOODED GAMMA-IRRADIATED SOIL UNDER CONTROLLED PH AND REDOX POTENTIAL CONDITIONS,
Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.
O. Van Cleemput, and W. H. Patrick, Jr.
Soil Biol Biochem. Vol 6, No 2, p 85-88, 1974, Illus.
Identifiers: Denitrifyication, Enzymes, *Flooded soils, Gamma-Irradiated soils, *Nitrate reduction, *Nitrite reduction, Organisms, Potential, Radiation, *Redox, Reduction, Resistant, Soil, Hydrogen ion concentration.

Nitrate and nitrite reduction was studied in a waterlogged soil after gamma irradiation with 2.5 Mrad. Before irradiation and mineral-N addition the pH was controlled at 4.5, 6 and 8, and the redox potential controlled at 0, +200 and +400 mV. Nitrate reduction rate increased with increasing pH as well as with decreasing redox potential. Nitrate reduction rate was doubled by decreasing the redox potential from +400 to 0 mV. At pH 4.5 almost no nitrite accumulated regardless of redox potential, while at pH 6 and 8 marked nitrite accumulation occurred at low redox potential. In relation to nonirradiation, gamma irradiation had a stimulating effect on nitrate reduction at pH 6 and 8 but a retarding effect at pH 4.5; nitrite reduction proceeded slower at pH 6 and 8 but at the same rate at 4.5. Nitrate and nitrite reduction can be carried out by radiation-resistant enzyme systems of non-proliferating cells of denitrifying organisms.-- Copyright 1974, Biological Abstracts, Inc.
W75-08470

MECHANICAL HARVESTING OF AQUATIC VEGETATION: DEVELOPMENT OF A HIGH SPEED PICKUP UNIT,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4A.
W75-08471

ANALYSIS AND DESIGN OF SETTLING BASINS FOR IRRIGATION RETURN FLOW,
Idaho Univ., Moscow. Dept. of Civil Engineering.
F. L. Ballard.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 345, $4.75 in paper copy, $2.25 in microfiche. M S Thesis, January 1975. 66 p, 14 fig, 10 tab, 14 ref, append. OWRR A-042-IDA(2).

Descriptors: *Sediments, *Sediment yield, *Settling basins, Irrigation, *Return flow, Erosion, Tailwater, Ponds, *Design criteria, *Regression analysis, Mathematical models, Phosphates, Nitrogen.

Nine fields under furrow irrigation were studied to determine sediment yield to ponds as a function of crop type, soil type and topography. Data were collected from seven farm settling ponds located on these fields to gain insight into the factors which affect pond removal efficiency. To determine design criteria for on-farm settling ponds, regression analysis was used to develop predictive equations for sediment yield. Independent variables included flow onto field, slope, furrow length, time of run, and the irrigated area. During an irrigated season 0.339 to 37.00 tons of sediment per acre were eroded. When regression analysis was used to find how pond efficiency was affected by parameters overflow rate, length to width ratio, sediment size and detention time, little was learned. However, a mathematical model was a useful tool for pond design; efficiencies ranged from 43.0%-100% for sediment and 28.6%-77.7% for phosphate and nitrogen.
W75-08484

ENVIRONMENT: A BIBLIOGRAPHY ON SOCIAL POLICY AND HUMANISTIC VALUES,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 10C.
W75-08489

URBAN STORM RUNOFF, PUGET SOUND REGION, WASHINGTON,
Washington Univ., Seattle. Coll. of Forest Resources.
D. D. Wooldridge, G. M. Mack, and J. Veasey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 304, $7.00 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Completion Report, February 1975. 182 p, 11 fig, 43 tab, 22 ref. OWRT B-042-WASH(1).

Descriptors: *Urban runoff, Storm runoff, *Washington, Land use, Regional development, Legal aspects, *Peak discharge, Small watersheds, *Runoff forecasting, Regulation.
Identifiers: Urban watersheds, *Puget Sound(Wash), *Storm runoff control.

Peak storm discharge had flood flow of a 225 year storm on an intensely developed small urban watershed when other streams with lesser urbanization had usual winter runoff. Mathematical relationships which predict mean daily discharge from precipitation show storm flow yields have increased from 130 to 185% over the past decade. These increases in flow range from 0.5 to 0.9 cubic feet per second per square mile per year, based on current trends. In area inches these range from 0.6 to 1.86 inches of increased runoff from small basins. Common law of surface water rights of the State of Washington has established that owners of lower land have the right to prevent upper land owners from burdening a natural watercourse with a quantity or velocity of water beyond its capacity. Governmental entities are subject to the same rights and liabilities in their public works. Governmental entities may constitutionally exercise regulatory or policy powers to impose burdens on land ownership and on construction of improvements where such regulation preserves or promotes public health, safety or general welfare. Counties and cities have statutory and constitutional power relating to both flood and surface waters. Considerable progress has been made in recent years in regulation and assessment of responsibilities for control of storm runoff. Improved control of storm runoff could be achieved by requirements for clearing and grading permits accompanied by an environmental assessment of the impacts of the proposed action on quantity, quality, and timing of storm flow. On site storage of stormwater in excess of natural flow must be provided in all development.
W75-08492

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, SEGMENT 4A,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08500

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, SEGMENT 4D,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08502

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SEGMENT 2E,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08504

PURIFICATION OF WASTEWATERS AND GASEOUS EMISSIONS IN THE U.S.A. (OCHISTKA STOCHNYKH VOD I GAZOVYKH VYBROSOV NA PREDPRIYATIYAKH S.SH.A.),
Ministerstvo Bumazhnoi i Derevoobrabatyvayushchei Promyshlennost, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W75-08540

STATISTICAL ANALYSIS OF THE PROCESS OF EFFLUENT PURIFICATION AT THE BAIKAL PULP MILL FOR THE PURPOSE OF CONTROL (STATISTICHESKII ANALIZ PROTSESSA OCHISTKI STOCHNYKH VOD BAIKAL'SKOGO TSELLYULOZNOGO ZAVOD DLYA TSELEI UPRAVLENIYA),
For primary bibliographic entry see Field 5D.
W75-08547

WATER INTAKE RATES ON A SILT LOAM SOIL WITH VARIOUS MANURE APPLICATIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-08574

INVESTIGATION OF RATIONAL EFFLUENT AND STREAM STANDARDS FOR TROPICAL COUNTRIES,
Asian Inst. of Tech., Bangkok (Thailand).
M. B. Pescod.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-782 199, $4.25 in paper copy, $2.25 in microfiche. US Army Research and Development Group, Far East, APO San Fransisco, Calif. Report No FE-476-2, May 1974. 60 p, 6 fig, 16 tab, 10 ref.

Descriptors: *Dissolved oxygen, *Water quality standards, *Asia, *Irrigation, *Fishing, *Waste water treatment, Water quality, Standards, Water pollution, Surface waters, Water pollution treatment, Potable water, Public health, Toxicants, Heavy metals, Temperature, Water pollution, Sources, Food chains, Dissolved solids, Oxidation lagoons.
Identifiers: *Stream standards.

Water quality standards were reviewed and tentative stream standards proposed for use in developing countries of Southeast Asia on the basis of legitimate water uses and adaptation of available data to local conditions. A survey of stream standards and water uses applied in the Southeast Asian region indicated that few countries had adopted standards and practically no attempt had been made to adjust to suit local conditions. Experimental studies suggested that oxidation pond effluent would have a beneficial effect on the ox-

ygen balance of a stream under tropical conditions provided that the algal concentration was not more than 1x105 cells/ ml after dilution in the stream. Oxidation ponds were assessed as being more attractive than either trickling filter or activated sludge treatment plants for populations less than 175,000 and land rental costs of U.S. $0.10 per square meter per year or less. (Katz)
W75-08584

PHYSICAL CRITERIA IN COMPUTER METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS,
Rutgers - the State Univ., New Brunswick, N.J. Dept. of Computer Science.
R. Vichnevetsky.
Proceedings of the International Association for Analog Computation, Vol 16, No 1, 1974, p 3-15. 15 fig, 47 ref. Paper was presented at the 7th International Congress, Prague, Aug 1973. OWRT B-045-NJ(1), B-049-NJ(1).

Descriptors: *Approximation method, *Model studies, Systems analysis, Simulation analysis, Estuaries.
Identifiers: *Numerical analysis, *Estuary quality models, Simulation.

Physical or problem related criteria are used to measure quantitatively certain aspects of numerical accuracy. Case studies involving partial differential equations commonly found in estuarial analysis are presented. (Davidson-Rutgers)
W75-08593

PROCESSING AND STORAGE OF WATER-HYACINTH SILAGE,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-08595

A NEW DORATOMYCES FROM WATER-HYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 4A.
W75-08606

ENVIRONMENTAL LOBBYING: TAKING THE RIGHT ISSUE TO THE RIGHT PLACE AT THE RIGHT TIME,
Clemson Univ., S.C.
For primary bibliographic entry see Field 6G.
W75-08608

OCCURRENCE OF CEROCOSPORA PIAROPI ON WATER HYACINTH IN FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W75-08610

DEVICE FOR CLEANING WATER POLLUTED BY OIL,
J. Rafael.
US Patent No. 3,875,062, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 341, April 1, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution control, Water quality control, *Pollution abatement, *Separation techniques, Equipment, Skimming.

A device for cleaning water polluted by oil comprises a floating body which contains an inlet opening and a collecting chamber for the polluted water. The collecting chamber has a cover and the water surface polluted by oil that is inside the collecting chamber is fully or partly in contact with the cover. The cover is arched so that the oil accu-

mulateds at the highest point of the arch. Oil removal means are provided on the cover and the inside of the cover is below the minimum skimming height of the inlet opening. The rear end of the collecting chamber is connected to two ducts through which the water flows out of the collecting chamber. The outlet ends of the ducts are constricted to a silt so that the speed of the emerging surface layer of the water is reduced and residual oil particles dragged along the roof of the ducts rise upwards. (Sinha-OEIS)
W75-08612

DEVICE FOR RECEIVING WATER SURFACE FLOATING IMPURITIES,
A. Y. Derzhavets, P. G. Kogan, and S. M. Nunuparov.
US Patent No 3,862,902, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 930, No 4, p 1874, January 28, 1975.

Descriptors: *Patents, *Flotsam, *Oil spills, *Oil pollution, *Pollution abatement, Water pollution control, Skimming, Jetsam, Domestic wastes, Boats, Bodies of water.

A device for receiving water surface floating impurities in the collecting receptacle of an oil and garbage skimmer craft is comprised of a gate installed at the inlet to the collecting receptacle. The upper horizongal edge of the gate forms a weir above which the upper layer of water together with floating impurities is overflowing. The gate is rigidly connected to a float. Both the gate and the float are fixed with a possibility for free rocking around a horizontal axis, thus providing for a constant depth of immersion of the upper horizontal edge of the gate in relation to the water level. The gate has an outside surface facing a water basin being cleaned and is given the shape of a portion of cylinder whose axis coincides with a horizontal axis around which the gate and float are rocking. (Sinha-OEIS)
W75-08623

OIL POLLUTION TOTALIZER,
J. O. Moreau, and R. A. Halko.
US Published Patent Application B 369,563, 4 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 930, No 4, p 1484, January 28, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution control, *Pollution abatement, Sensors, Filters, *Separation techniques.
Identifiers: Ballast, Deballasting, Refinery wastes.

An oil pollution totalizer is provided for accumulating all of the oil from a sample stream at a rate which is directly proportional to the rate of oil being discharged, e.g., in a stream from a tanker during a deballasting operation or in an effluent stream from a refinery operation. The totalizer comprises means for removing the oil from the sample stream and means for controlling the sample flow rate in proportion to the stream flow rate, and then finally, means for storing the oil for analysis such as by a continuous oil monitoring device or by standard laboratory techniques. (Sinha-OEIS)
W75-08624

INSTALLATION FOR SEPARATION ON THE SEABED OF THE EFFLUENTS FROM UNDERWATER OIL WELLS,
Entreprise de Recherches et d'Activities Petrolieres, Paris (France).
P. Charpentier.
US Patent No 3,875,998, 4 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 661, April 8, 1975.

Descriptors: *Patents, *Oil wells, *Oil spills, *Pollution abatement, Water pollution control, Equipment, Effluents, *Separation techniques.
Identifiers: Underwater wells.

An installation for separation on the seabed of the effluents from underwater oil wells consists of a base with negative buoyancy anchored on the seabed, and a hermetic caisson attached to this base and preferably articulated on it. It is equipped with at least one gas/liquid separator which is connected by pipes to each underwater well and from which one pipe leads to a burner, with another pipe to draw off the liquid phase. A buoyant tubular column surmounts the caisson and is connected to it. The upper end of this column which is above water, supports a platform, and means inside the caisson control the operation of the separator. (Sinha-OEIS)
W75-08629

SKIMMING DEVICE,
Societe Nationale des Petroles d'Aquitaine, Paris (France). (Assignee).
For primary bibliographic entry see Field 5D.
W75-08636

REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION AND REGENERATION OF SULFUR CONTAINING ADDITIVES,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5A.
W75-08642

A REVIEW OF EXPLOSIVES USED IN EXPLOSIVE EXCAVATION RESEARCH LABORATORY PROJECTS SINCE 1969,
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
For primary bibliographic entry see Field 8H.
W75-08650

LAND USE AND NUCLEAR POWER PLANTS - CASE STUDIES OF SITING PROBLEMS,
Directorate of Regulatory Standards (AEC), Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-08654

DEEP ROCK NUCLEAR WASTE DISPOSAL TEST: DESIGN AND OPERATION,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 5E.
W75-08656

ON THE SELECTION OF A GROUND DISPOSAL SITE FOR RADIOACTIVE WASTES BY MEANS OF A COMPUTER,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
S. Morisawa, and Y. Inoue.
Health Physics, Vol 27, No 5, p 447-457, November 1974. 9 fig, 1 tab, 10 ref.

Descriptors: *Radioactive waste disposal, *Sites, *Computer program, *Nuclear powerplants, *Effluents, *Model studies, *Strontium, Environmental effects, Safety, Evaluation, Assessment, Public health, Groundwater, Water table, Water flow, Porosity.
Identifiers: *Site selection, *Population exposure, *Human dose, Internal dose.

Processes of selecting optimum locations for the disposal of radioactive wastes by means of a computer are discussed. A program for site selection is based on some reasonable assumptions and includes the data required to estimate the dose of radioactivity in the human body due to the disposed wastes of a nuclear facility along a coast. The calculations were made for a model nuclear facility that was chosen to show the general method of selecting a ground disposal site. An optimum location for a ground disposal site is defined as a location with minimum internal dose

caused by the disposed wastes. Four locations were selected using a computer, each location having a minimum internal dose based on the assumption of 0.1 Ci/yr leakage of Sr 90. The minimum internal dose for the four locations was estimated to be lower than 10(-80) mrem/yr. The method of selecting optimum locations is resonably promising for solving current problems of site selection for disposal. A chart to compare the safety of sites by evaluating each with reference to eighteen environmental factors is included. (Houser-ORNL)
W75-08665

STORMWATER CONTROL KEY TO BAY POLLUTION SOLUTION.
For primary bibliographic entry see Field 5D.
W75-08671

PUMPS FOR POLLUTION CONTROL,
For primary bibliographic entry see Field 5D.
W75-08674

COASTAL POWER PLANT HEAT DISPOSAL CONSIDERATIONS,
Southern California Edison Co., Rosemead, Calif.
D. M. Golden.
Journal of the Environmental Engineering Division, ASCE, Vol 101, No EE3, Proceedings paper No 11359, p 365-380, June 1975. 1 tab, 11 ref.

Descriptors: *Water pollution control, *Environmental engineering, *Energy, *Thermal pollution, *California, Coasts, Oceanography, Legislation, Underwater, Pipelines, Conduits, Water resources, Environmental effects, Environmental control, Demand, Costs, Planning, Evaluation, Design.
Identifiers: *Environmental impact statements, *Thermal diffusion.

Presented is an overview of some of the engineering and ecological considerations that need to be evaluated in the selection of optimal once-through waste heat disposal systems. The review focuses on open ocean discharges along the southern California coast, but the information should have wide application. Examination of cooling system alternatives for powerplants in coastal areas indicates that once-through cooling is the most favorable from an overall environmental standpoint. Preliminary evaluation of the year-long Thermal Effect Studies conducted at all California coastal powerplants indicates that existing thermal discharges are exerting only localized environmental impacts. With proper oceanographic and biological surveys to determine the aquatic inhabitants and hydraulic characteristics of a potential site, a criterion can be developed to discharge the thermal effluent safely into the ecosystem. However conceptually attractive geothermal, hydroelectric, solar, tidal, and fusion power may be, it would appear that none of them has the capability of providing sufficient amounts of power to meet the projected demands for electrical energy during the next two decades. (Bell-Cornell)
W75-08719

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville. Dept. of Finance.
For primary bibliographic entry see Field 6C.
W75-08722

GRAVITY OIL-WATER SEPARATOR WITH TWO INTERCONNECTED SINGULAR CELLS HAVING AUTOMATIC FREE OIL DISCHARGE,
For primary bibliographic entry see Field 5D.
W75-08735

CORONA DISCHARGE TREATMENT OF AN OIL SLICK,
P. C. Stoddard.

U S Patent No 3,865,722, 5 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 813, February 11, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution control, Electrical coronas, Extra high voltage, *Separation techniques.
Identifiers: Corona discharge.

A process is described in which an oil slick floating on a water surface is subjected to a high voltage corona discharge for a time sufficient to effect a change in its physical properties. The oil is then allowed to congeal and preferably conglomerate after which it is removed from the water surface by conventional techniques such as, for example, with the air of a surface suction pump. Because the oil becomes cohesive and tends to conglomerate when subjected to the corona, it is far easier to handle during removal operations. A corona discharge is the ionization of the gas surrounding an electrical lead raised to a high electrical potential. The physical properties of the oil change such that the oil in the slick tends to become cohesive and the slick itself not only stops spreading but may even conglomerate. (Sinha-OEIS)
W75-08753

OIL SPILL CLEANUP,
Shell Oil Co., Houston. Tex. (Assignee).
R. R. Ayers, and D. P. Hemphill.
U S Patent No 3,865,730, 3 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 815, February 11, 1975.

Descriptors: *Patents, *Skimming, *Oil spills, Oil pollution, *Pollution abatement, *Water pollution control, Equipment, *Separation techniques.

An apparatus for removing oil from the surface of water comprises a rotatable drum immersed in the water up to about its axis of rotation, and compartments arranged around the periphery of the drum for admitting oil and water to an axial chamber in the drum. The compartments have spiraling funnels diminishing in cross-sectional area from the periphery of the drum to the axial chamber. The axial chamber is divided into upper and lower rooms, the lower room providing an exit for the water-rich effluent, and the upper room providing an exit for an oil-rich effluent. (Sinha-OEIS)
W75-08754

AERATORS WITH DE-ICING MEANS,
B. E. Hirshon.
U S Patent No 3,865,908, 4 p, 13 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 858, February 11, 1975.

Descriptors: *Patents, *Waste water treatment, *Pollution abatement, *Aeration, *Deicers, *Water pollution control, Conduits, Water circulation, Equipment.
Identifiers: Ice formation.

An aerator is placed in a body of open water such as a lake, pond, river, or bay, where ice formation is to be expected. The aerator has an inflow and outflow conduit with their upper ends interconnecting in part below the surface level of the body of water and with their lower ends so disposed relative to each other as to inhibit circulation between them. Also included is a wall structure extending above the water level to bar the inflow of surface water, means to effect the flow of water upward through the inflow portion through the interconnecting portion, and downward through the outflow portion as a continuous stream and to aerate the circulating water before its entry into the outflow portion. The interconnecting porting is oriented to provide a time delay in the flow of elevated water into the outflow portion to permit the escape of air. The aerator is inclined upward and outward to provide sufficient draft to facilitate

the freeing of the ice as an incident to the operation of the aerator. (Sinha-OEIS)
W75-08755

SYSTEM FOR SEPARATING HYDROCARBONS FROM WATER,
Fram Corp., East Providence, R.I. (Assignee).
J. D. Conley, D. E. Belden, and R. D. Terhune.
U S Patent No 3,878,094, 3 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 933, No 3, p 1340, April 15, 1975.

Descriptors: *Patents, *Oil pollution, *Pollution abatement, *Waste water treatment, *Water quality control, Emulsions, *Separation techniques, Organic compounds, *Emulsifiers.
Identifiers: Emulsified hydrocarbons.

The invention features a mechanical emulsion breaker for removing emulsified hydrocarbon from the water stream, and, upstream of the emulsion breaker, a separator for removing from the stream free and entrained hydrocarbon. A preconditioner upstream of the emulsion breaker removes solids and initiates the separation of hydrocarbon. Controls maintain the hydrocarbon-water interface levels in the separator and the emulsion breaker within predetermined limits despite variation of the hydrocarbon concentration in the incoming stream. This prevent re-mixing of water and hydrocarbon. The controls operate in a closed, pressurized system by sensing the interfaces and adjusting the hydrocarbons and water discharge rates. A monitor continuously measures hydrocarbon concentration in the treated water discharge and provides a signal to recycle that discharge in the event effluent quality is too low. (Sinha-OEIS)
W75-08757

MECHANICAL ELIMINATION OF AQUATIC GROWTHS,
M. P. Chaplin.
U S Patent No 3,878,669, 8 p, 43 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 933, No 4, p 1546, April 22, 1975.

Descriptors: *Patents, *Eutrophication, *Pollution abatement, *Water quality control, Lakes, Rivers, Streams, Rooted aquatic plants, *Aquatic weed control, Water utilization.

The apparatus and method for eliminating upstanding, floating and other aquatic growths from lakes, rivers and streams, including much of their root structure are described. It comprises of mechanically moving the upstanding and floating aquatic growths generally downward to a zone automatically controlled as to its position relative to the root structure of the growths. Suction is applied to draw the growths and roots through a cutting zone where the growths and roots are cut into short pieces. They are moved into a vacuum chamber where entrained air and growths juices are removed from their stems and leaves and the growths structure collapsed. The cut and collapsed growths and roots may then be subjected to a second cutting operation, with or without pressure, to further destroy their growth identity, and reduce the growths and roots to a finely divided inert mass. They may then be spread as a blanket on the water bottom from which the growths and roots were originally removed, or delivered to a remote location. (Sinha-OEIS)
W75-08761

THE PROTECTION OF THE QUALITY OF WATERS, AN IMPORTANT ELEMENT IN THE CONSERVATION OF NATURE, (IN ROMANIAN),
Consililul National al Apelor, Bucharest (Rumania).
M. Lazarescu.
Ocrotirea Nat. Vol 17, No 1, p 45-52, Illus, 1973, Rom. and Fr. summ.).

Descriptors: Water reuse, Waste water treatment, Water pollution, Water quality, *Water pollution control, *Water quality control, Water pollution sources, Fertilizers, Detergents, Pesticides, Water temperature, Organic compounds, Water pollution effects, Industrial wastes, Chemical industry, Pulp and paper industry, Oil industry.
Identifiers: Romania.

The actions taken in Romania to prevent water pollution and to develop water resources of good quality necessary for development are outlined. A 1972 law limits water pollution and a special program approved in 1971 provides for research in water quality and pollution. Various factors such as fertilizers, detergents, pesticides, hydrocarbons and changes in water temperature are analyzed with respect to their specific effects on water quality, flora and fauna. Experimental water protection units associated with a paper plant and an antibiotic factory are illustrated. In the years 1960-1970, 1000 water purification installations were constructed and installations are currently being added at the chemical works of Fagaras and Tirnaveni, at the petroleum refineries of Ploesti and at the paper factories of Suceava. The quality of water needed for various uses is defined. Water reuse in industrial units and processes to recover valuable products formerly discharged into polluted waters are discussed.--Copyright 1975, Biological Abstracts, Inc.
W75-08775

SHORT-RUN EFFECTS OF AN INCREASED EFFLUENT CHARGE IN A COMPETITIVE MARKET,
North Carolina Univ., Chapel Hill.
K. L. Wertz.
Canadian Journal of Economics, Vol 7, No 4, p 676-682, 1974. 8 ref.

Descriptors: *Pollution taxes(Charges), *Elasticity of demand, *Equilibrium prices, *Model studies, *Industrial wastes, Industrial production, Assessments, Profit, Effluents, Economics.
Identifiers: Short-term economic effects, Competitive markets, Statics analysis, *Effluent charges, Partial equilibrium model, Sensitivity indicators(Economic), Marginal product.

Relationships between the magnitude of effluent charges, production levels, prices, pollution and profits in competitive industries are investigated. A firm subject to increased charges usually abates by transferring resources from production to control, where the value of the marginal product of each factor has increased relative to its value in production. A simple partial equilibrium model of a charge-paying firm is developed around a general specification of the firm's emission control function that permits an interaction of variable factors of emissions control and levels of production to generate a level of emissions. Other equations assume the level of a firm's pollutant emissions to be governed either by the employment of variable factors to emissions control or by its choice of production level. A comparative statics analysis identifies characteristics of industries in which increased effluent charges would lead to changes in short-run output, price, and emissions levels. The elasticities of various cost functions and the price elasticity of demand are combined to give indicators of the sensitivity of short-run levels of output, price and emissions to increased effluent charges. Competitive producers as a group, after effluent charges are increased, may enjoy higher profits prior to new firms entering the market. (Becker-Wisconsin)
W75-08778

ENVIRONMENTAL ECONOMICS: A THEORETICAL INQUIRY,
Stockholm Univ. (Sweden). Dept. of Economics.
K-G. Maler.
The Johns Hopkins University Press, Baltimore and London. 1974. 267 p, $15.00.

Descriptors: *Welfare(Economics), *Pollutants, *Compensation, *Resources, *Value engineering, *Theoretical analysis, Social values, *Pollution taxes(Charges), Effluents.
Identifiers: Materials-balance model, Externalities, Effluent charges, General equilibrium, Partial equilibrium, Pareto optimality, Economic growth.

Problems connected with payment for discharge of residuals into the environment are approached from both theoretical and practical points of view. The natural environment is a public good with no market in which buyers and sellers reveal preferences. A simple materials-balance, general equilibrium model is constructed with five flow sites--environment, production, consumption, capital accumulation and environmental management--connected by the exchange of goods, services and residuals. A Pareto optimal equilibrium exists where the markets are cleared and profits and utilities are maximized. Charges, bribes and compensation are considered in a discussion of the determination of optimal policy connected with waste discharges. Bribes and charges are equivalent from a purely theoretical point of view, but differ in the area of administration and enforecement. Compensation of consumers for environmental degradation may have income effects. Economic growth and the quality of the environment are tied to questions of resource allocation over time. The demand for environmental services, although important in the consideration of resource allocation, is not revealed through a market structure. Alternative methods for determining consumer preferences are discussed. The notion that it is possible to support an optimum with prices on waste disposal is considered in relation to alternative environmental policies. (Becker-Wisconsin)
W75-08780

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES--FLAT GLASS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
W. Lee.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-234 845, $4.25 in paper copy, $2.25 in microfiche. Report No. EPA-230/2-74-013, August 1974. 71 p, 20 tab. 68-01-1541.

Descriptors: *Pollution abatement, *Waste water treatment, Standards, *Economic impact, *Industrial wastes, Effluents, Pricing, Unit costs, Employment, Fabrication, *Water quality standards.
Identifiers: *Flat glass industry, Sheet glass industry, Plate glass industry, Float glass industry, Automotive glass industry.

An analysis of the economic impact of EPA water pollution control requirements on the flat glass industry is provided. Initial segmentation of the industry into sheet glass, plate glass and float glass was revised when it was determined that the waste water treatment costs associated with meeting anticipated guidelines were small for sheet glass and float glass fabricators. Rolled and polished glass segments were excluded since they represent a relatively small fraction of the total glass industry. Final impact assessment was made on the plate glass, solid tempered automotive glass, and laminated windshield fabrication industry segments. Impact was analyzed for three levels of treatment: (1) Best Practicable Technology (BPT), (2) Best Available Technology (BAT), (3) New Source Performance Standards (NSPS). The economic impacts analyzed are: (1) price, (2) profitability, growth and capital availability, (3) employment, (4) community effects, (5) balance of payments, (6) related industries. The economic impacts of the BPT and BAT levels of treatment on each industry segment are presented (the proposed control technology of NSPS is identical to BAT for the float glass, solid tempered automotive glass and laminated windshield fabircation segments). Little or no impact is expected in any of the flat

glass industry segments at either level of treatment. (BeckercWisconsin)
W75-08781

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: RUBBER PROCESSING INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
J. T. Howarth, J. A. Carter, and K. R. Sidman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-235 691 $3.75 in paper copy, $2.25 in microfiche. Report No. EPA-230/2-74-024, August 1974. 61 p, 7 fig, 22 tab, 2 append. 68-01-1541.

Descriptors: Standards, *Industrial wastes, *Effluents, *Economic impact, *Pollution abatement, Synthetic rubber, Capital costs, Operating costs, Prices, Waste water treatment, *Water quality standards.
Identifiers: Rubber processing industry, Tires and tubes.

Waste treatment costs associated with the Best Practical Technology and Best Available Technology Economically Achievable for the synthetic rubber and tires and tubes segments of the rubber processing industry are analyzed. The investment, annual costs and estimated price increases as a percent of sales are summarized and averaged for the two segments. The additional costs are not expected to exert a significant impact on the market and prices of the respective products. It is not anticipated that any plants will be closed in either the synthetic rubber or tire and tube sectors. However, there may be a short period of plant shutdown, particularly in the older plants, while effluent lines are segregated. No adverse effects on the industry's growth due to BPT, BAT, and New Source Performance Standrds are indicated. Costs should not significantly affect either the domestic market competitiveness or the international market. The conclusions are based on the guidelines as proposed in the Effluent Guideline Development Documents, the associated technology to meet these limits, and the related cost. The calculated price increases for these pollution guidelines are the maximum expected increases. Certain companies and certain plants already meet BPT guidelines and may not increase their prices at all. (Auen-Wisconsin)
W75-08782

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR SELECTED SEGMENTS OF THE SEAFOOD PROCESSING INDUSTRY. (CATFISH, CRAB, SHRIMP AND TUNA),
Development Planning and Research Associates, Inc., Manhattan, Kans.
D. L. Jordening.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 214, $5.75 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-025, July 1974. 127 p, 3 fig, 40 tab. 68-01-1533.

Descriptors: *Waste treatment, *Fish handling facilities, *Economic impact, Standards, Economic efficiency, Shrimp, Crabs, Catfishes, Industrial wastes, Canneries, Pollution abatement, *Water quality standards.
Identifiers: Seafood processing plants, Tuna.

The economic impacts of EPA proposed effluent guidelines for the tuna, shrimp, crab and catfish industries are assessed. Specialty item plants, reprocessing plants, and plants where less than 80% of the total value of all output is from shrimp, crab, tuna, or catfish are excluded from this analysis. Except for the tuna processing sector, the industry can be characterized as a composite of many small, underutilized, old plants. Each segment is analyzed separately for financial characteristics, and a segment profitability range is estimated. Return on sales analysis with profitability measures are used in assessing the severity of the

effluent restrictions. The impact methodology includes five basic parts: (1) industry segmentation, (2) pollution abatement cost conversion, (3) preliminary impacts with cost of pollution abatement as a percent of sales, (4) price effects induced by abatement standards, and (5) estimated impacts of standards on viability of plants. Effects of effluent controls on financial status, production, employment, community, and balance of trade are analyzed. The Best Practicable Technology effluent control level was estimated to have an insignificant impact on the evaluated segments of the seafood industry. In general, the availability of municipal wastewater treatment systems will be important in the number of closures of processing plants. (Becker-Wisconsin)
W75-08783

HYDRAULIC ENGINEERING AND THE ENVIRONMENT.
For primary bibliographic entry see Field 8B.
W75-08786

REGULATION OF LOW STREAMFLOWS,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 4A.
W75-08808

PHYSICAL AND BIOLOGICAL REHABILITATION OF A STREAM,
Montana State Univ., Bozeman. Dept. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-08810

DEVELOPMENT OF A WATER PLANNING MODEL FOR MONTANA,
Montana State Univ., Bozeman. Dept. of Industrial Engineering and Computer Science.
For primary bibliographic entry see Field 6A.
W75-08811

WATER POLLUTION CONTROL BY HYDRAULIC AERATION,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
H. J. Leutheusser, and F. J. Resch.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 315-321, 1973. 6 fig, 10 ref.

Descriptors: *Hydraulic jump, *Aeration, *Aerobic treatment, *Water pollution control, Water pollution, Water quality, Bubbles, Turbulent flow, Critical flow, Hydraulics, Fluid mechanics, Biochemical oxygen demand, Sluice gates, Flumes, Laboratory tests.

An important process involved in the natural purification of streams is the removal of biodegradable pollutants by the action of aerobic microorganisms. This exerts a biochemical oxygen demand which must be satisfied by the atmosphere in order to maintain the water quality at an acceptable level. The familiar phenomenon of hydraulic jump is beginning to receive attention as a potentially well-suited hydraulic aeration device. The investigation of entrainment characteristics was carried out in the bubbly two-phase flow region of jumps created in a horizontal, 15.25 m long and 0.39 m wide laboratory flume. The findings suggest that hydraulic jumps with both undeveloped and with fully developed inflow will function well as effective aerators. The size of air bubbles occuring is small, but the large number of bubbles provides a large effective interfacial contact area between air and water. There was clear evidence, however, that the jump with fully developed inflow retains its air content far longer than does its undeveloped

counterpart. It would thus appear that this type of hydraulic jump, which is also characterized by especially intense mixing, ought to be particularly well suited for applications as a hydraulic aeration device. (See also W75-08786) (Sims-ISWS)
W75-08814

POLLUTION POTENTIAL OF A SANITARY LANDFILL NEAR TUCSON,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5B.
W75-08823

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, RED RIVER BASIN, DORCHEAT BAYOU, SEGMENT 1A,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08837

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, RED RIVER BASIN, SEGMENT 1B,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08838

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, BOEUF RIVER AND BAYOU MACON, SEGMENT 2A,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08839

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, BAYOU BARTHOLOMEW, SEGMENT 2B,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08840

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SEDMENT 2D,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08841

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SALINE RIVER, SEGMENT 2C,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08842

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, OUACHITA RIVER BASIN, SEGMENT 2F,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08843

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, SEGMENT 5A,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-08844

CONTRASTS IN COMMUNITY ACTION AND OPINION,
Oregon State Univ., Corvallis. Dept. of Anthropology.
C. L. Smith.

Water Resources Bulletin, Vol 10, No 5, p 877-883, October 1974. 2 fig, 11 ref. OWRT B-023-ORE(4).

Descriptors: *Surveys, *Attitudes, Waste water(Pollution), Management, Decision making, Rural areas, Surburban areas, Community development, Data collections, Sewage, Organizations, Sampling, Water pollution control.
Identifiers: *Population growth, Human behavior, Environmental quality.

Opinion or attitude surveys and observations of people's actions are complementary research tools, but they often provide different results. This was the case where two communities, one rural and one suburban, made waste water management decisions which would promote population growth while survey data indicated that community attitudes were neutral or slightly opposed to population growth. Observation of action, and expanding the range of survey response variation, revealed that the structure of both community opinion and action was primarily influenced by small groups of people with very strong feelings favoring and disfavoring population growth. Those with very strong feelings were the ones observed to be acting to promote or retard growth. (Bell-Cornell)
W75-08848

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME I: COMPLETION REPORT,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
W. Unterberg, A. L. Mindling, J. A. Dracup, J. W. Bulkley, and G. L. Widman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 300, $6.25 in paper copy, $2.25 in microfiche. Report R-9625-1, March 1975. 165 p, 5 fig, 32 tab, 19 ref. OWRT C-1734(No 3395)(1), and C-3151(No 9000)(1). 14-31-0001-3393 and-9000.

Descriptors: Water resources development, *Management, Planning, Arid climates, Semiarid climates, Decision making, *Computer models, Political aspects, Water law, *City planning, Urbanization, Cities, *Simulation analysis, *Model studies, *Arid lands, Environment, Computer programs.
Identifiers: *Urban water resources, Strategic planning, Case studies, *Gaming simulation, Multi-disciplinary constraints, Las Vegas(NV), Oxnard(CA), Salt Lake City(UT), San Bernardino(CA), San Diego(CA), Tucson(AZ), Carson City(NV), Goleta County Water District(CA), Alamogordo(NM).

In Phase I (Project C-1734), an appraisal was made of urban water development and management in arid and semiarid environments by means of case studies of key historic water decisions in six cities. In each city alternative solutions to water resource problems and organizations and factors that affected the decisions were identified and researched through interviews. These data were inputs to a Political Interaction Simulation computer program (PISP), which was used to model the decision-making processes. The results of the case studies led to guidelines that were applied, during Phase II (Project C-3151) in three arid and semiarid cities having to make key water decisions in the near future. This included the use of PISP as a predictive decision-making tool, validated by election results, and the development of a Gaming Simulation tool entitled 'The Water Game', as a strategic arid urban water resources planning tool. This Game was played and is available for dissemination. (See also W75-08353)
W75-08352

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME II: THE WATER GAME--GAMING SIMULATION FOR URBAN WATER RESOURCES PLANNING,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
W. Unterberg, J. A. Dracup, W. J. Trott, and M. E. Mulvihill.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 301, $5.75 in paper copy, $2.25 in microfiche. Report R-9625-2, March 1975. 146 p, 8 fig, 13 tab. OWRT C-1734(No 3395)(1), and C-3151(No 9000)(1), 14-31-0001-3393 and 9000.

Descriptors: Water resources development, *Management, Planning, Arid climates, Semiarid climates, Decision making, *Computer models, Political aspects, Water law, *City planning, Urbanization, Cities, *Simulation analysis, *Model studies, *Arid lands, Environment, Computer programs.
Identifiers: *Urban water resources, Strategic planning, Case studies, *Gaming simulation, Multi-disciplinary constraints, Las Vegas(NV), Oxnard(CA), Salt Lake City(UT), San Bernardino(CA), San Diego(CA), Tucson(AZ), Carson City(NV), Goleta County Water District(CA), Alamogordo(NM).

Volume 2 deals with the generation and practice of The Water Game, a Gaming Simulation for Urban Water Resources Planning. Part 1, 'Game Description' deals with the development and detailed features of The Water Game. It includes the documentation and listing of the digital computer program that forms part of the gaming simulation. Part 2 constitutes the 'Players' Manual,' which is the actual document used by the participants during the playing of the game. Because both parts are paginated separately, is Players' Manual can be removed from this volume and bound separately for practical use. Part 1 is written for the reader, and Part 2 for the player. Where the interests of the two are identical (e.g., introduction to gaming simulation, water supply alternatives, and elsewhere), identical prose has been used, although the coverage may be more detailed in one part than the other. (See also W75-08352)
W75-08353

THE ESTIMATION OF (RHO) IN THE FIRST-ORDER AUTOREGRESSIVE MODEL: A BAYESIAN APPROACH,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-08387

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W75-08404

DEVELOPMENT OF A MANAGEMENT FRAMEWORK OF THE GREAT SALT LAKE,
Utah Water Research Lab., Logan.
J. P. Riley, C. G. Clyde, W. J. Grenney, Y. Y. Haimes, and C. T. Jones.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 327, $4.25 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan, Publication JEW116-1, March 1975. 70 p, 19 fig, 3 tab, 62 ref, append. OWRT A-019-UTAH(1). 14-31-0001-3545.

Descriptors: Water resources, Planning, *Management, Systems analysis, Simulation analysis, *Brine shrimp, *Great Salt Lake, *Utah, *Model studies, Environmental effects, Coordination, Lakes, Legal aspects, Social values, Water supply, Recreation, Tourism, Transporation.
Identifiers: Oil drilling, Mineral extraction.

The development of a comprehensive management framework of the Great Salt Lake is a complex process involving the cooperation and close coordination of many groups, disciplines, and activities. The study was divided into three separate phases. Phase I provides the overall structural framework for management of the Great Salt Lake, identifies the data needs, and establishes priorities for the development of submodels (both structural and non-structural) for incorporation into the overall framework. The submodels can be developed both from basic considerations and through the modifications of existing models. Results of Phase I are summarized. Phase II involves the process of developing submodels, and Phase III is concerned with the application of the framework of models to specific management problems. The management framework developed here takes into account the major societal and economic uses of the Great Salt Lake. These uses are (1) recreation and tourism, (2) mineral extraction, (3) transportation, (4) brine shrimp harvesting, (5) oil drilling, and (6) fresh water supply. On the basis of these six major uses, a chart was prepared which lists the potential impacts on cultural and social factors, biological conditions, and physical and chemical characteristics resulting from alterations to the existing lake system.
W75-08473

EVALUATION OF A PROBABILITY APPROACH TO UNCERTAINTY IN BENEFIT-COST ANALYSIS,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-08478

STOCHASTIC ANALYSIS OF TRICKLING FILTER,
Texas Univ. at Austin. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-08720

MADAM I--A NUMERIC METHOD FOR DESIGN OF ADSORPTION SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5D.
W75-08726

APPLICATION OF A HYDROLOGIC MODEL FOR LAND USE PLANNING IN FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 4A.
W75-08727

OPTIMAL CAPACITIES OF WATER SUPPLY RESERVOIRS IN SERIES AND PARALLEL,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Regional Science.
For primary bibliographic entry see Field 4A.
W75-08728

A TECHNIQUE FOR THE PREDICTION OF WATER DEMAND FROM PAST CONSUMPTION DATA,
Sheffield Univ. (England). Dept. of Control Engineering.
For primary bibliographic entry see Field 6D.
W75-08730

THE CIVIL ENGINEER AND FIELD DRAINAGE,
Ministry of Agriculture, Fisheries and Food. Lincoln (England).
For primary bibliographic entry see Field 4A.
W75-08731

DEVELOPMENT OF A WATER PLANNING MODEL FOR MONTANA,
Montana State Univ., Bozeman. Dept. of Industrial Engineering and Computer Science.
D. W. Boyd, and T. T. Williams.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 269-278, 1973. 3 fig, 1 tab.

Descriptors: *Model studies, *Water resources, *Planning, Computer models, Numerical analysis, Hydrologic aspects, Hydrology, Surface waters, Groundwater resources, Water storage, Water utilization, *Montana.
Identifiers: *Yellowstone River Basin(Mont).

A water planning research effort resulted in a series of three models, each one more refined than the previous one. The three modeled hydrologic systems were (1) Montana, (2) the Yellowstone River Basin in Montana, and (3) a sub-basin of the Yellowstone. Although a particular basin and subbasin were used in the development, each version of the model is completely general, and may be calibrated for two or more sub-basins. These models may be subsequently linked to permit the study of any combination of sub-basins. Any version of the model could be applied easily to any drainage basin whereever located. It is not limited to Montana. Although the model is hydrologic in scope, it is capable of receiving a water-quality overlay, or of providing the constraints for the optimization of an economic objective function. (See also W75-08786) (Sims-ISWS)
W75-08811

THE IMPACT OF WATER QUALITY OBJECTIVES ON URBAN WATER SUPPLY PLANNING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-08845

6B. Evaluation Process

EFFECTS OF URBANIZATION ON WATER QUALITY,
Water Resources Engineers, Inc., Springfield, Va. and DeKalb County Planning Dept., Decatur, Ga.
For primary bibliographic entry see Field 5B.
W75-08351

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME I: COMPLETION REPORT,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 6A.
W75-08352

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME II: THE WATER GAME--GAMING SIMULATION FOR URBAN WATER RESOURCES PLANNING,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 6A.
W75-08353

REGIONAL PROBLEM ANALYSIS IN THE PACIFIC NORTHWEST: PART A-INSTREAM FLOW NEEDS; PART B-BASALT AQUIFERS; PART C-WILD AND SCENIC RIVERS.
Washington State Water Research Center, Pullman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242

280, $5.25 in paper copy, $2.25 in microfiche. Completion Report, March 1975. 122 p, 1 fig, 3 tab, OWRT B-056-WASH(1).

Descriptors: *Regional analysis, *Research priorities, Interstate, *Wild rivers, Water allocation, Basalts, Aquifers, Conjunctive use, *Pacific Northwest US, Water resources, Planning, *Water requirements, *Water utilization, Social aspects.
Identifiers: Scenic rivers, *Basalt aquifers.

A four-state project engaged the states of Alaska, Idaho, Oregon, and Washington to jointly undertake a regional problem-research analysis of water resources problems in the Pacific Northwest. Activities are summarized of the three contiguous states to identify, analyze the structure, evaluate alternatives for resolution, and assess the knowledge and understanding required for the resolution of three water-related problems of the Pacific Northwest. The three regional problems analyzed were: (1) instream flow needs methodology to determine how much water is required for various water uses; (2) study of the basalt aquifers in Washington, Oregon, and Idaho to determine the extent, boundaries, capacity, and potential uses; (3) the impact of designation of Wild and Scenic rivers on other values, including social, economic, and political values, and upon alternative uses for water and adjacent land resources. Selection of these three areas for in depth analysis was based on a survey of state and federal agency representatives and legislators in the three states. A series of workshops with a combination of university faculties and agency representatives was the primary method used for analyzing the problems. The results of the problem analyses for each of the problem areas are reported in detail.
W75-08356

ENERGY PRODUCTION AND WATER SUPPLY,
Utah State Univ., Logan.
C. G. Clyde.
In: Energy, Environment and Water Resources, Proceedings of the Universities Council on Water Resources Meeting, July 28-31, 1974. Logan Utah. p 319-331, (1974) 9 fig, 3 tab, 7 ref.

Descriptors: *Resources development, *Powerplants, *Energy, *Electric power production, *Colorado River, *Water shortage, Coals, Colorado River Basin, *Water supply, Nuclear powerplants, Environmental effects, Arizona, Colorado, Wyoming, California, Nevada, Mexico, New Mexico, Utah, Agriculture, Irrigation, Air pollution, Water pollution, Regional analysis.
Identifiers: Project independence.

The Colorado River Basin is rich in energy resources and poor in its water supply. An overview is given of how the region's energy and water future fits into national patterns. Fifteen questions are directed at participants of the conference to aid them in discovering how additional energy reserves can be developed in a region where water is already totally committed, if not over-committed. (Bowden-Arizona)
W75-08369

ENERGY-WATER RELATIONSHIPS: MANAGEMENT AND CONSERVATION IN THE CALIFORNIA-COLORADO RIVER - GREAT BASIN REGIONS,
Nevada Univ., Reno.
G. F. Cochran.
In: Energy, Environment and Water Resources, Proceedings of Universities Council on Water Resources Meeting, July 28-31, 1974. Logan, Utah. p 332-340, (1974) 4 ref.

Descriptors: *Colorado River Basin, *Great Basin, *Electric power production, *Energy, *Environmental effects, *Water shortage,

*California, Colorado, Arizona, New Mexico, Mexico, Utah, Nevada, Wyoming, Institutional constraints, Planning, Regions, Regional analysis.
Identifiers: Project Independence.

Water and energy resources of the Colorado River Basin, California, and the Great Basin are reviewed. The Colorado River, under the existing plan of development, is a bankrupt stream in terms of both quality and commitments for use of its waters. Because Project Independence will increase demand for water from this overtaxed flow, the need for systematic planning is stressed. For example: if energy production retires agricultural land in the region because there is insufficient water for both, additional crop production must be planned for some other part of the country, if shortages are to be avoided. Conservation must be considered as a way to lower both water and energy demands. (Bowden-Arizona)
W75-08370

INSTITUTIONAL ASPECTS OF ENERGY-WATER DECISIONS IN THE PACIFIC SOUTHWEST REGION,
Arizona Univ., Tucson.
H. M. Ingram.
In: Energy, Environment and Water Resources, Proceedings of Universities Council on Water Resources Meeting, July 28-31, 1974. Logan, Utah. p 344-353, (1974), 4 tab, 3 ref.

Descriptors: *Colorado River Basin, Watershed management, *Colorado River Compact, *Legal aspects, *Energy, Arizona, Nevada, California, Utah, New Mexico, Wyoming, Powerplants, Water shortage, Institutional constraints, Electric power, Production, Environmental effects, *Southwest U.S., *Regional analysis.

The Pacific Southwest Region is fragmented into states and cities competing with each other for water resources. Traditionally, water decisions have been made at the federal level; the states, long resentful of this fact, are now fighting to raise a larger role in such decisions. However, energy development now promises to be a major factor in future water allocation plans, and the states lack any institutional framework adequate for competing with federal agencies in this area. Thus, without clear energy policies, the states face renewed pressure in their efforts to make their own water resource allocation decisions. (Bowden-Arizona)
W75-08372

APPLICATIONS OF HYDROLOGY TO WATER RESOURCES MANAGEMENT (PLANNING AND DESIGN LEVEL),
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
V. Klemes.
Operational Hydrology Report No. 4, World Meteorological Organization Publication No. 356, Geneva (Switzerland), 1973. 104 p, 20 fig, 9 tab, 52 ref.

Descriptors: *Water resources development, *Planning, *Design, Analytical techniques, Hydrologic aspects, *Hydrology, Surface waters, *Management, Runoff, Surface runoff, Statistical methods, Stochastic processes, Streamflow, Storm runoff, Droughts, Water shortage, Regulated flow, Simulation analysis, Numerical analysis, Floods, Flood routing, Flood control, Hydrographs, Maximum probable flood, Channels, Reservoirs, Flood frequency, Flood discharge.

Discussed were the different methods and concepts involved in the practical applications of hydrology and the effective use of hydrological techniques in the planning, design, and management of projects in the field of surface water resources. Groundwater resources were not considered. A general discussion was presented of new trends, conceptual changes, and the gradual

broadening of the scope of water resources management involving the adoption of systems analysis, statistical and probabilistic concepts, and extensive use of high-speed digital computers. Discussed were techniques of extracting the maximum amount of information obtainable from single station records, methods of assessing its reliability, extending streamflow records of a single station, and indirect determination of streamflow. Various interpretations of droughts were reviewed, and objectives of analysis, methods of analysis, and streamflow regulation by means of storage reservoirs were discussed. Techniques of flood analysis, flood synthesis, flood routing and flood control were described. (Humphreys-ISWS)
W75-08400

ECONOMIC VALUE OF WATER-ORIENTED RECREATION QUALITY,
Utah State Univ., Logan. Dept. of Economics.
E. B. Wennergren, H. H. Fullerton, J. E. Keith, and R. Meale.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 368, $3.75 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan Publication PRRAE 805-1, January 1975. 27 p, 7 fig, 12 tab, append. OWRT C-4371(no 9064)(2). 14-31-0001-9064.

Descriptors: *Boating, Economics, *Economic rent, *Recreation, Linear programming, Recreation demand, *Utah, *Idaho, *Evaluation, Recreation facilities, Lakes, Regression analysis.
Identifiers: *Recreation site quality, Consumers surplus, Transportation algorithm.

A linear programming system was developed to segregate total site values into location and quality components. Empirical value estimates, both aggregate and quality, were made for 42 boating sites in Utah and 69 sites in Idaho. The estimated aggregate value for Utah, based on the rent model, was $1,113,577, and for Idaho $4,601,125. Quality values accounted for approximately 82 percent of total value in Utah and 74 percent in Idaho. In Utah, differences in site quality were significantly related to lake size and campsite facilities. The partial regression coefficient was positive and statistically significant at the 1 percent level. The model R2 was .81. In Idaho, site quality differences were significantly related to variation in boat launching ramps. The partial regression coefficient was positive and statistically significant at the 1 percent level. The model R2 was .76. A mathematical comparison of the estimates of site value b based on the concepts of economic rent and consumer surplus revealed that rent estimates typically exceed those of consumer surplus. However, the empirical estimation procedures can cause the relationship to fluctuate depending upon the expansion methodology used to derive population estimates from sample data.
W75-08469

UNIVERSITY OF NEBRASKA FACULTY WITH COMPETENCE IN WATER RESOURCES - SECOND EDITION.
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 10D.
W75-08472

DEVELOPMENT OF A MANAGEMENT FRAMEWORK OF THE GREAT SALT LAKE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W75-08473

EVALUATION OF A PROBABILITY APPROACH TO UNCERTAINTY IN BENEFIT-COST ANALYSIS,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-242 370, $4.25 in paper copy, $2.25 in microfiche. California Water Resources Center, Davis. Contribution No 149, April 1975. 61 p, 6 fig, 23 tab, 23 ref. OWRT A-053-CAL(1).

Descriptors: *Cost-benefit analysis, *Cost-benefit ratio, *Probability, *Risks, Evaluation, Feasibility studies, Cost analysis, Stochastic processes.
Identifiers: *Weibull probability distribution.

Application of the Weibull probability distribution to the problem of uncertainty in benefit-cost analysis was tested. While there is no formal theoretical basis for describing the stochastic behavior of variables in benefit-cost analysis as Weibull distributions, the economy of information, versatility with regard to shape, ability to incorporate objective information, and ease of mathematical manipulation, support the use of the distribution. Compared to range sensitivity tests, the only additional pieces of information required are the probabilities that the actual values of the variables will be less than the low or exceed the high of the range. The Weibull probability assignment technique is applied for four separate benefit-cost studies. The standard deviation and central tendency measures of the outcome distribution (net benefits, benefit-cost ratio, etc.), as well as the probability of an outcome indicating the project is not feasible, are among the valuable new information provided. The results obtained indicate that the technique tested is a significant improvement over range sensitivity tests to resolve uncertainty in benefit-cost analysis. (Snyder-California, Davis)
W75-08478

DIRECTORY OF KENTUCKY WATER RESEARCH PERSONNEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 10D.
W75-08485

A CASE STUDY OF THE APPLICATION OF COST-BENEFIT ANALYSIS TO WATER SYSTEM CONSOLIDATION BY LOCAL GOVERNMENT,
Delaware Univ., Newark. Div. of Urban Affairs; and Delaware Univ., Newark. Water Resources Center.
M. R. Brams.
The Engineering Economist, Vol 17, No 2, p 99-114, 1972. 2 fig, 3 tab, 8 ref. OWRR-A-003-DEL(8).

Descriptors: *Water distribution(Applied), *Water works, *Economic feasibility, *Cost-benefit analysis, Benefits, Local governments, Public utilities, Cost-benefit ratios, Investment, Decision making, *Delaware.
Identifiers: *Water system consolidation, New Castle County(Del), Private companies, Acquisition costs, Case study.

The economic and engineering feasibility of county ownership of all municipal and private water systems serving the northern area of New Castle County, Delaware, is tested using cost-benefit analysis. The present value of the quantifiable anticipated benefits of this plant for physical and administrative unification of the county's water system are computed for various alternative discount rates and time periods. The benefits estimated include changes in efficiency, improved allocation of resources, and financial impacts. On the basis of these estimated present values, alternative costs of purchasing the private water companies as based on their capitalized earnings, original cost, replacement cost, or fair value are evaluated. Keeping in mind that many specified benefits and costs could not be estimated, it was concluded that unification might be justified in instances when the benefit-cost ratio exceeded one. Thus, benefit-cost analysis can only provide a per-

spective for public decision-making. (Weaver-Wisconsin)
W75-08573

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: FISHERIES,
Washington Univ., Seattle. Coll. of Fisheries.
M. C. Bell, and B. W. Mar.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 512, $3.75 in paper copy, $2.25 in microfiche. State of Washington Water Research Center, Pullman, Partial Completion Report No 17F, November 1974. 34 p, 6 fig, 11 tab, 12 ref. OWRT B-036-WASH(7), B-043-WASH(6), B-050-WASH(6).

Descriptors: *Washington, *Model studies, *Systems analysis, *Fish reproduction, *Fish management, Salmon, Rainbow trout, Computer models, Runoff, Water management(Applied), Water resources, Planning, Water rights, Watersheds(Basins), *Fisheries, River basins.
Identifiers: *Yakima River basin(Wash).

The fisheries model is a simple analytical statement of fish production as a function of wetted area in any given reach. A major limitation of model development is the high cost of information. Physical characteristics of each reach are costly to define and fish production is difficult to measure. Sensitivity of fish production to drift in water quality and fishing effort and difficult to formulate. Based on the simple analysis it was demonstrated that the capacity of the river to produce fish cannot be increased more than a factor of 2-4. Furthermore, increase of salmon and steelhead may not be cost effective since major investments in fish passage and screening are required. The release of flows to achieve minimum low flows below diversions can produce significant increases in sport fish, but ponds or other man-made impoundments may be required in the long run.
W75-08580

2020 HINDSIGHT: ANOTHER FIFTY YEARS OF IRRIGATION,
Committee on Interior and Insular Affairs (U.S. Subcommittee on Water and Power Resources.
For primary bibliographic entry see Field 3F.
W75-08721

APPLICATION OF A HYDROLOGIC MODEL FOR LAND USE PLANNING IN FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 4A.
W75-08727

A MANAGEMENT PROGRAM FOR THE OYSTER RESOURCE IN APALACHICOLA BAY, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W75-08772

TAX WEDGES AND COST-BENEFIT ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Economics.
R. N. McKean.
Public Finance, Vol 29, No 1, p 105-109, 1974. 1 fig, 6 ref.

Descriptors: *Evaluation, *Cost-benefit analysis, *Taxes, *Economic efficiency, Resource mix.
Identifiers: *Tax wedges, Excise tax, Income tax, Sales tax, Shadow prices.

Observed prices for taxed items reflect the wedge driven between the marginal rates of substitution in consumption and marginal rates of transforma-

tion. These prices are therefore likely to be inappropriate for use in cost-benefit analyses. Corporate income taxes would distort the marginal rate of substitution between present and future goods, causing the price of neither to be necessarily correct for use as the discount rate in cost-benefit analyses. An excise tax or a non-general sales tax on an input to a project would cause the same discrepancy with the marginal rate of substitution between the taxed input and other goods, and would result in a problem of valuation of the input for the cost-benefit analysis of the project. A similar set of relations exists for personal income tax (and social security taxes) and marginal rates of substitution between labor and other inputs. General sales taxes, the employer's part of social security taxes, and value-added taxes also produce wedge effects, but the wedge is in a different place. In order to understand and make judgments about cost-benefit analyses, it should be recognized that the tax-wedge mix seriously adds to the conceptual difficulties that beset the preparation and interpretation of the evaluation. (Becker-Wisconsin)
W75-08779

ENVIRONMENTAL ECONOMICS: A THEORETICAL INQUIRY,
Stockholm Univ. (Sweden). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-08780

MARINE TRADES AND THE COASTAL CRISIS,
Rhode Island Univ., Kingston. Coastal Resources Center.
M. J. Grant.
Available from the National Technical Information Service, Springfield, Va. 22161 as COM-74-10953. $3.25 in paper copy, $2.25 in microfiche. Marine Bulletin Series No. 18, 1974, 8 p.

Descriptors: *Marinas, *Recreation facilities, *Coasts, *Competition, *Shores, Recreation, Public utilities, Industries, Transportation, Boats.
Identifiers: *Coastal management, *Marine trades, Coastal development, Marine recreation.

Coordinated management and comprehensive planning would prevent haphazard development and enhance the utility of the coastal zones. The demand for 89,000 miles of ocean and 11,000 miles of Great Lakes shoreline exceeds the supply. Participants in the rush for shoreline include heavy industry, commerce, transportation, public utilities, residential developers, fisheries and recreation--with their needs often contradictory. Since the distribution of land is characteristically determined by who will pay the most, uses that pay the highest returns are favored. Increasing amounts of shoreline are appropriated by a limited number of such highly competitive uses as residential development, heavy industry and power generation. Public marine recreation is in a poor competitive position because its return is diffuse and largely nonmonetary. The many trades and industries which service and supply the marine recreationist are affected adversely. Among the affected interrelated industries are marinas, boatyards, engine and boat equipment manufacturers and distributors, and lending institutions. Also hindering the small independent marine operations is piecemeal supervision by government agencies. Comprehensive management can both increase the activities the coastal zone will support, and provide a focus for organized efforts for participation in planning and decision making by groups such as marine trades. (Becker-Wisconsin)
W75-08784

ARTIFICIAL RECHARGE IN THE URBAN ENVIRONMENT--SOME QUESTIONS AND ANSWERS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4B.

W75-08822

THE IHD--TEN YEARS OF PROGRESS,
National Committe for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 2A.
W75-08829

EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08847

CONTRASTS IN COMMUNITY ACTION AND OPINION,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 5G.
W75-08848

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFECTS OF PRICE CHANGE UPON THE DOMESTIC USE OF WATER OVER TIME,
Clemson Univ., S.C. Dept. of Agricultural Economics.
R. M. Pope, Jr., J. M. Stepp, and J. S. Lytle.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 279, $5.75 in paper copy, $2.25 in microfiche. South Carolina Water Resources Research Institute, Clemson Report No 56, March 1975. 129 p, 21 fig, 30 tab, 48 ref, 4 append. OWRT B-032-SC(3).

Descriptors: Water demand, *Pricing, *Water rates, *Elasticity of demand, *South Carolina, Cities, Municipale water, Water uses, Water utilization.
Identifiers: *Price changes, Temporal analysis, *Residential water users.

This research is based upon mail-survey data and monthly water-use records for a randomized sample of 1464 households in four South Carolina municipalities which increased the price of water during the period 1966-1969. In each case the data were for 12 months before the price change and 24 months thereafter. It was hypothesized that the residential water-use effect of a price increase (i.e. elasticity of demand) would tend to decrease over time as people become accustomed to paying the higher price, and it would be hoped that a 'turning point' could be identified. Non-comparability of 'monthly' water-use records precluded meaningful analysis of monthly differences in water use, but demand elasticity coefficients computed on an annual basis for the first and second years following the price increases supported the hypothesis stated above. For 820 non-irrigators, whose water use was presumably not affected by the amount and timing of rainfall, the 4-city average elasticity of demand coefficient was -0.26 the first year and -0.11 the second year following the price change. For all 1464 respondents the comparable figures were -0.33 and -0.14.
W75-08355

AN ECONOMIC ANALYSIS OF CHANGES IN IRRIGATION PRACTICES IN JEFFERSON COUNTY, IDAHO,
Idaho Univ., Moscow. Department of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W75-08481

METHODOLOGY FOR OBTAINING LEAST COST IRRIGATION STEM SPECIFICATIONS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-08482

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: FISHERIES,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 6B.
W75-08580

ALLOCATING ENVIRONMENTAL RESOURCES,
Virginia Univ., Charlottesville.
A. H. Barnett, and B. Yandle, Jr.
Public Finance, May 1973. 16 p, 2 fig, 9 ref. S-038-SC.

Descriptors: *Economics, *Resource allocation, *Decision making, Water management, Marginal costs, Marginal benefits, Optimization, Economic efficiency.
Identifiers: *Contrived markets, Bidding scheme, Property rights, Externalities.

A contrived market process is outlined for the allocation of environmental resources. Making the assumption that the particular resource to be allocated has been previously a part of the common wealth of the community, a governmental authority claims title to the resource and develops a bidding scheme whereby allocation to competing users occurs. In the process the 'optimal' level of quality is determined, these quality shares are allocated, and all parties bidding are paid for their losses of the previous common wealth and pay for their newly acquired rights to quality. A critique of the process is also given.
W75-08598

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville. Dept. of Finance.
W. Goolsby.
Journal American Water Works Association, Vol 67, No 5, p 220-224, May 1975. 6 fig, 2 equ, 20 ref.

Descriptors: *Water supply, *Pricing, *Investment, *Demand, *Economies of scale, Water distribution(Applied), Water treatment, Costs, Marginal costs, Estimating, Peak loads, Optimization, Mathematical models, Equations, Systems analysis.
Identifiers: Production function, Production plant, Capacity, Plant expansion.

Presented in a discussion emphaizing the two cycles of concern to water suppliers -- the demand cycle and the investment cycle. An attempt is made to show the interaction of pricing and investment policies under conditions of indivisibilities, cyclical demand, demand that grows over time, and economies of scale. All of these factors should be accounted for by a metropolitan water supplier, with the possible exception of demand that grows over time. Moreover, these factors should be considered simultaneously since they are inextricably bound together. The response of water prices to the demand and the investment cycles should be that prices rise with increased demand, whether the increase in demand occurs because of weather, population or income growth, or whatever, and that prices fall with increases in excess capacity, whether an increase in excess capacity occurs as the result of an expansion of the existing plant or a slackening of demand. Water suppliers should not require subsidies, but losses experienced in slack periods should be covered by profits in periods when the capacity of the water facility is fully utilized. In effect, slack periods may extend over several years as well as seasonally. Water suppliers should consider both cycles when establishing price. (Bell-Cornell)

W75-08722

ENGINEERING ECONOMICS OF RURAL SYSTEMS: A NEW U S APPROACH,
National Water Well Association, Columbus, Ohio; and Rice Univ., Houston, Tex.
For primary bibliographic entry see Field 4A.
W75-08723

SAMPLE UNCERTAINTY IN FLOOD LEVEE DESIGN: BAYESIAN VERSUS NON-BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Hydrology and Water Resources Interdisciplinary Program.
For primary bibliographic entry see Field 8A.
W75-08724

A 'RATIONAL' POLICY FOR THE ENERGY AND ENVIRONMENTAL CRISES,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W75-08732

A MANAGEMENT PROGRAM FOR THE OYSTER RESOURCE IN APALACHICOLA BAY, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Economics.
C. E. Rockwood.
Available from the National Technical Information Service Springfield Va 22161 as COM-74-11640 $10.00 in paper copy, $2.25 in microfiche. Report No. NOAA-74100803, May 1973. 352 p. 4 fig, 42 tab, 96 ref. N-042-44-72(N).

Descriptors: *Management, *Commercial shellfish, *Oysters, *Shellfish farming, *Economic impact, *Social impact, Employment opportunities, Marketing, Reefs, Harvesting, *Florida.
Identifiers: *Oyster industry, Franklin County(Fla.), Apalachicola Bay(Fla.).

The Apalachicola oyster industry needs a community-approved program of change and development. All oyster resource management changes in the relatively small oyster based economy of Apalachicola and of Franklin County have important long range consequences for local employment patterns, family structure, and community life. Three specific management objectives are developed in conjunction with an economic analysis of alternatives and an assessment of sociological consequences of the proposed changes: (1) productivity improvement--by the mechanization and modernization of the harvesting process and of the oyster industry in general, and by the establishment of regulations on minimum harvestable size and on selective closing of oyster bars; (2) output enhancement--by reef planting and cultivation and by the control of water pollution and oyster predation and disease; and (3) marketing promotion--by improving the quality and packaging of the delivered product and by promoting the wholesomeness and tastiness of Apalachicola oysters. A management policy that does not encompass all three of these objectives is less likely to be of net social benefit to Apalachicola and probably would be opposed strongly for that reason. A rank ordering of management alternatives for each objective based on economic and sociological or community preference points of view is provided. (Becker-Wisconsin)
W75-08772

STREAM CHANNELIZATION: THE ECONOMICS OF THE CONTROVERSY,
Cornell Univ., Ithaca, N.Y. Dept. of Economics.
J. P. Brown.
Natural Resources Journal, Vol 14, No 4, p 557-576, 1974. 9 ref.

Descriptors: *Cost allocation, Rivers, *Channel improvement, *Jurisdiction, Environmental effects, Decision making, Alteration of flow, Relative rights, Financing, Welfare(Economics).
Identifiers: *Stream channelization, Externalities.

The merits of stream channelization must be evaluated on the level of the individual project since each project contains different private and social costs and benefits. Outdoor recreationists emphasize the externalities associated with stream channelization--the effects on fish and wildlife--while private citizens or groups are concerned with maximizing the difference between private costs and private benefits. Three methods of stream channelization are discussed: (1) increasing the channel cross-section by excavation, (2) by building levees, and (3) increasing the velocity of the stream by lowering frictional drag. The major benefits of stream channelization are flood probability reduction and drainage of wetlands. Alternatives to channelization are also presented. Stream channelization externalities, including downstream effects, effects on other users of the rivers, and the effects on later generations, should be included in any computation of costs and benefits associated with a project. If externalities exist, then the private individual wealth maximizer should not make final allocation decisions, but rather jurisdiction should be at a local governmental level, such as Water Conservation District. The appropriate role of the Federal Government is to represent the otherwise unrepresented interests and restict rather than encourage the construction of these projects. (Becker-Wisconsin)
W75-08777

SHORT-RUN EFFECTS OF AN INCREASED EFFLUENT CHARGE IN A COMPETITIVE MARKET,
North Carolina Univ., Chapel Hill.
For primary bibliographic entry see Field 5G.
W75-08778

TAX WEDGES AND COST-BENEFIT ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-08779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES--FLAT GLASS INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-08781

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: RUBBER PROCESSING INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-08782

6D. Water Demand

EFFECTS OF PRICE CHANGE UPON THE DOMESTIC USE OF WATER OVER TIME,
Clemson Univ., S.C. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W75-08355

ECONOMIC VALUE OF WATER-ORIENTED RECREATION QUALITY,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-08469

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville. Dept. of Finance.
For primary bibliographic entry see Field 6C.
W75-08722

A TECHNIQUE FOR THE PREDICTION OF WATER DEMAND FROM PAST CONSUMPTION DATA,
Sheffield Univ. (England). Dept. of Control Engineering.
M. J. H. Sterling, and D. J. Antcliffe.
Journal of the Institution of Water Engineers, Vol 28, No 8, p 413-420, November 1974. 4 fig, 15 equ, 4 ref.

Descriptors: *Water demand, *Water management(Applied), Industrial water, Rural areas, Estimating, Computers, Methodology, Equations, Stochastic processes, Systems analysis, *Forecasting.
Identifiers: *Water consumption data, *Spectral analysis, Demand functions, Covariance matrix, Orthogonal functions.

The need for analysis of demand in a water undertaking is apparent at the network control level, where the time scale of interest is usually on an hourly, daily or weekly basis enabling scheduling of pumping facilities and inter-reservoir transfers. The management function requires a long-term forecast of total consumption for several years ahead. The data available on which to base such an estimate is past consumption records together with allowance for known future industrial and residential developments which will represent a significant percentage of the total demand. This paper compares an automated demand prediction scheme based on current manual methods with a technique using spectral representation by orthogonal functions, formulated in terms of the characteristic functions of a covariance data matrix. The covariance matrix requires only a record of daily consumptions averaged for each month prior to the prediction point, thereby obviating the need for consideration of weather parameters. Results show that a prediction technique based on spectral expansion by orthogonal functions of past data is suitable for the estimation of water consumption. The method can produce demand predictions within satisfactory operational requirements by consideration of the actual consumption over a period of several years. The technique is suitable for both short and long term forecasts. (Bell-Cornell)
W75-08730

A 'RATIONAL' POLICY FOR THE ENERGY AND ENVIRONMENTAL CRISES,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
M. Gysi.
Water Resources Bulletin, Vol 11, No 3, p 551-558, June 1975. 1 fig, 5 ref.

Descriptors: *Water resources, *Water supply, *Pricing, *Conservation, Economic justification, Demand, Water costs, Water allocation(Policy), Environment.
Identifiers: *Scarce resources, Demand function, *Energy crisis, Calgary(Alberta), Metered water.

The present energy and environmental crises are due to increasing per capita demands as well as increasing populations. The role that traditional pricing policies have played in promoting these demands is discussed. The reduction or stabilizing of percapita demands is advocated through the use of Conservational Pricing mechanisms which charge higher average prices for high consumption. Such a pricing system is socially justified in the same sense as progressive income tax rates--namely, payment in accordance with ability to pay. A second social justification for Conservational Pricing (C.P.) is that large consumers, who often are wasters, would pay proportionately more for their

larger appetites. Another economic justification for C.P. is that it would certainly delay a utility's capacity expansion requirements, lowering the use of resources and long run supply costs. An example of the effect of C.P. in the water supply industry is given. Conservational Pricing could offer short term easing of the energy and environmental crises by lowering per capita demand. Administrators responsible for resources allocation should consider C.P. in addition to searching for new supplies in the race to lower demand-supply differentials. (Bell-Cornell)
W75-08732

MARINE TRADES AND THE COASTAL CRISIS,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 6B.
W75-08784

6E. Water Law and Institutions

WATERSHED ORGANIZATIONS - IMPACT ON WATER QUALITY MANAGEMENT, AN ANALYSIS OF SELECTED MICHIGAN WATERSHED COUNCILS,
Michigan State Univ., East Lansing. Dept. of Resources Development.
For primary bibliographic entry see Field 5G.
W75-08354

INSTITUTIONAL ASPECTS OF ENERGY-WATER DECISIONS IN THE PACIFIC SOUTHWEST REGION,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6B.
W75-08372

OIL SPILL PROTECTION IN THE BALTIC SEA,
Institute for Water and Air Pollution Research, Stockholm (Sweden). Project on Ecological Effects of Oil Pollution in the Baltic Sea.
For primary bibliographic entry see Field 5G.
W75-08464

A CASE STUDY OF THE APPLICATION OF COST-BENEFIT ANALYSIS TO WATER SYSTEM CONSOLIDATION BY LOCAL GOVERNMENT,
Delaware Univ., Newark. Div. of Urban Affairs; and Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W75-08573

STATUTORY DEFINITIONS OF FRESHWATER WETLANDS.
Chapter 818, Acts of the Great and General Court of Massachusetts, p 2-4, (1974). OWRT B-023-MASS(12). 14-31-0001-3596.

Descriptors: *Wetlands, Northeast U.S., *Massachusetts, Bogs, Swamps, Marshes, *Water law, *Legislation.

The first legal definitions of bogs, swamps, wet meadows and marshes in Massachusetts legislation are provided. These definitions facilitate the implementation of the state's Wetland Protective Act, Chapter 131, Section 40, General Laws of the Commonwealth of Massachusetts.
W75-08594

ENVIRONMENTAL LOBBYING: TAKING THE RIGHT ISSUE TO THE RIGHT PLACE AT THE RIGHT TIME,
Clemson Univ., S.C.
For primary bibliographic entry see Field 6G.
W75-08608

THE PROTECTION OF THE QUALITY OF WATERS, AN IMPORTANT ELEMENT IN THE CONSERVATION OF NATURE, (IN ROMANIAN),
Consiliul National al Apelor, Bucharest (Rumania).
For primary bibliographic entry see Field 5G.
W75-08775

STREAM CHANNELIZATION: THE ECONOMICS OF THE CONTROVERSY,
Cornell Univ., Ithaca, N.Y. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W75-08777

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR SELECTED SEGMENTS OF THE SEAFOOD PROCESSING INDUSTRY. (CATFISH, CRAB, SHRIMP AND TUNA),
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-08783

RESEARCH AND ADVANCES IN GROUND-WATER RESOURCES STUDIES, 1964-1974,
Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 2F.
W75-08825

THE IHD--TEN YEARS OF PROGRESS,
National Committe for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 2A.
W75-08829

6F. Nonstructural Alternatives

FLOOD PLAIN MANAGEMENT IN MONTANA,
Montana Dept. of Natural Resources and Conservation, Helena. Floodway Management Bureau.
C. Parrett.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 85-91, 1973. 2 fig, 4 ref, 1 append.

Descriptors: *Flood protection, *Flood plain zoning, *Management, Flood plains, Floodways, Land use, River basin development, Non-structural alternatives, Flood damage, Flood frequency, Flood recurrence interval, Legislation, Legal aspects, *Montana.

Although floodplain management has just started in Montana, the eventual implementation of floodplain regulations will hopefully have a significant effect on flood-damage prevention. Montana's floodplain law is based on an established and workable law in Nebraska and seems to offer a sound legal basis for floodplain land-use restrictions. In addition, Montana's proposed minimum standards for regulation are based on workable models used elsewhere. Two signficant problems, however, could seriously limit the overall success of Montana's floodplain management program. One major problem is the length of time and expense required to prepare the technical floodplain delineation data. Sound data are needed for effective regulation, but floodplain development often takes place much more rapidly than the data can be supplied. The second significant problem concerns local opposition to land-use regulation. Regulatory programs require local people to pay the costs for flood-damage prevention, and this is often opposed if communities are not fully aware of the potential benefits. Not only is engineering expertise required to help administer a management program, but engineering activities on floodplain areas can significantly affect potential flood

hazard. The engineer thus has a responsibility to insure that his floodplain works are compatible with periodic flooding and that they do not increase potential flood damages. (See also W75-08786) (Sims-ISWS)
W75-08795

FLOODLAND MANAGEMENT: THE ENVIRONMENTAL CORRIDOR CONCEPT,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 105-111, 1973. 8 ref, 1 append.

Descriptors: *Flood plain zoning, *Regulation, *Beneficial use, Flood plains, Legal aspects, Zoning, River basin development, Non-structural alternatives, Planning, Management, Regional development, Social aspects, Recreation facilities, Scenery, *Wisconsin.

The primary objective of floodland management in contemporary engineering and planning practice is to accomplish the single purpose objective of tailoring urban development to riverine areas in such a manner so as to mitigate flood damages. It was maintained that, in the context of regional land and water resource planning, floodland management should incorporate a second, equally important objective: protection of environmental corridors and recreational, scenic, ecological, and cultural values inherent in them. The environmental corridor concept as applied by the Southeastern Wisconsin Regional Planning Commission in its regional land and water resources planning programs consists of identifying the corridors--using delineated floodlands for the basic form--and recommending various means whereby much of the corridor lands can be retained in natural or partly developed open space for public use and enjoyment. (See also W75-08786) (Sims-ISWS)
W75-08797

PILOT STUDY IN FLOOD PLAIN MANAGEMENT,
Washington State Univ., Pullman. R. L. Albrook Hydraulic Lab.
A. C. Mueller, and J. E. Hoffman.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 113-120, 1973. 2 fig, 1 tab, 2 ref, 1 append.

Descriptors: *Hydraulic models, *Model studies, *Flood plains, Flooding, River flow, Flow around objects, Land use, City planning, Roughness(Hydraulic), Flow resistance, Erosion, *Washington.
Identifiers: *Pullman(Wash).

A pilot study in floodplain management with the Washington Department of Ecology was undertaken at the Albrook Hydraulic Laboratory. The study consisted of basic data gathering, analyzing, and interpreting the needed investigation of statewide flooding and related problems. The construction of a physical hydraulic model to investigate many of the problems was a significant portion of the study. It was decided to model approximately one mile (1.6 km) of the river in Pullman, Washington, including the downtown floodplain. Small improvements such as modification of the channel and man-made structures in partcularly bothersome areas were observed to ascertain their effects. The full range of flows were checked for each change tested from a minor flood of 10-yr return frequency to the 100-yr frequency flood. The model was used as a pilot project to demonstrate and test many types of management and

control features. The outstanding feature of this type of model is visualization. Engineers and laymen can get a better grasp of the situation. The physical model provides an overview of flooding problems which is difficult to convey through words and tabulated data. (See also W75-08786) (Sims-ISWS)
W75-08798

6G. Ecologic Impact Of Water Development

THE POLLUTION ENVIRONMENT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5G.
W75-08371

ENVIRONMENTAL EFFECTS OF DREDGING AND SPOIL DISPOSAL,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5C.
W75-08465

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT-PHASE II,
Washington Cooperative Fishery Unit, Seattle.
For primary bibliographic entry see Field 5B.
W75-08468

ENVIRONMENT: A BIBLIOGRAPHY ON SOCIAL POLICY AND HUMANISTIC VALUES,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 10C.
W75-08489

ANALYSES OF SELECTED CONSTITUENTS IN NATIVE WATER AND SOIL IN THE BAYOU BOEUF-CHENE-BLACK AREA NEAR MORGAN CITY, LOUISIANA, INCLUDING A MODIFIED STANDARD ELUTRIATE TEST,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-08501

ENVIRONMENTAL PROTECTION IN KRAFT PULP MILLS,
Munksjo A.B., Jonkoping (Sweden).
For primary bibliographic entry see Field 5D.
W75-08566

ECOLOGICAL APPROACH TO POWER GENERATION UNDER ENVIRONMENTAL CONSERVATION,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
L. T. Fan, C. L. Hwang, S. H. Lin, and R. Shojalashkari.
Kansas Water Resources Research Institute, Manhattan Contribution Number 114. In: Energy 73, First International Seminar and Exhibition, Palais du Centenaire, Brussels, September 10-14, 1973, p 127-161, (1973), 12 fig, 2 tab, 47 ref. OWRR B-030-KAN(7), 14-31-0001-3592.

Descriptors: Thermal pollution, *Environmental control, Conservation, Water quality, *Systems analysis, Operations research.
Identifiers: *Thermal pollution control, *Power generation, *Environmental conservation, System engineering.

Power generation and environmental conservation are two human activities of the utmost importance and yet their requirements are diametrically opposed. It is highly desirable that an interdisciplinary or systems approach be employed to find an optimal solution which satisfies such requirements. Several examples of systems engineering approaches to thermal pollution control are illustrated. However, a need for non-technological approaches is also emphasized.
W75-08604

ENVIRONMENTAL LOBBYING: TAKING THE RIGHT ISSUE TO THE RIGHT PLACE AT THE RIGHT TIME,
Clemson Univ., S.C.
H. E. Albert.
Paper Presented in Rural Sociology Section, ASAW, Proceedings for 1973. 16 p, 2 fig, 16 ref. OWRR B-034-SC(8).

Descriptors: *Administration, *Local governments, Water pollution, Economic development, Environment, South Carolina, State governments, Environmental effects.
Identifiers: Victoria Bluff(So Car).

A particularly bitter struggle between certain segments of the private sector and the state and local governments of South Carolina occurred in 1969 and 1970. The conflict was precipitated by the announcement that Badische Anilin und Soda Fabrik Corporation (BASF) would build a $200 million petrochemical plant at Victoria Bluff in Beaufort County, South Carolina. The private sector was unique in its ability to organize and oppose public policy ans was ultimately effective in preventing the state and industry from locating the plant at Victoria Bluff. The decisive factor was reception at the national level of the private sector complaints. This reception was enhanced by the fact that many of the leaders of the opposition against BASF were personal friends of high level government personnel, were active in the Republican Party at the national level (which happened to be in control of the executive branch of the national government), and had long practiced the skills of interest groups. Research methods consisted primarily at structured interviews, and search public and private files.
W75-08608

ANALYSIS OF POPULATION, BIRTH, AND DEATH STATISTICS IN THE COUNTIES SURROUNDING THE BIG ROCK POINT NUCLEAR POWER STATION, CHARLEVOIX COUNTY, MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W75-08653

LAND USE AND NUCLEAR POWER PLANTS - CASE STUDIES OF SITING PROBLEMS,
Directorate of Regulatory Standards (AEC), Washington, D.C.
R. Ramsey, and P. R. Reed.
Available from the Superintedent of Documents, Government Printing Office, Washington, DC, for $0.95. Rept No WASH-1319, October 1974. 58 p, 12 fig, 3 tab.

Descriptors: *Nuclear powerplants, *Sites, *Environmental effects, *Land use, Wetlands, Urban sociology, Agriculture, Forest soils, Land.

Until recently, public concern with nuclear power plants had concentrated on the impact of thermal effluents on nearby water bodies. But since the water problem has changed increasingly from an impact assessment problem to a problem of meeting strict government standards, concern has shifted to other types of impacts from power plant siting. In particular, a great deal of interest has developed in the impacts of siting a nuclear power plant on surrounding land use. Four cases are discussed involving nuclear plants (built, proposed, or under construction). These cases are intended to illustrate direct land use impacts on four different types of land: in terms of U. S. Geological Survey Land Classification System these are 'Urban and Built-up Lands,' 'Agricultural Land,' 'Wetlands,' and 'Forest Land.' Also, an indirect effect on another land type ('Barren Land') is discussed in one of the cases. (Houser-ORNL)
W75-08654

REACTOR SAFETY STUDY - AN ASSESSMENT OF ACCIDENT RISKS IN U.S. COMMERCIAL NUCLEAR POWER PLANTS. APPENDIX VII - RELEASE OF RADIOACTIVITY IN REACTOR ACCIDENTS (DRAFT),
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5C.
W75-08655

ON THE SELECTION OF A GROUND DISPOSAL SITE FOR RADIOACTIVE WASTES BY MEANS OF A COMPUTER,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5G.
W75-08665

DREDGED SPOIL DISPOSAL ON THE NEW JERSEY WETLANDS: THE PROBLEM OF ENVIRONMENTAL IMPACT ASSESSMENT,
Rutgers - The State Univ., New Brunswick, N.J. Marine Science Center.
For primary bibliographic entry see Field 5C.
W75-08716

COASTAL POWER PLANT HEAT DISPOSAL CONSIDERATIONS,
Southern California Edison Co., Rosemead, Calif.
For primary bibliographic entry see Field 5G.
W75-08719

ENVIRONMENTAL ECONOMICS: A THEORETICAL INQUIRY,
Stockholm Univ. (Sweden). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-08780

ECONOMIC AND ENVIRONMENTAL EVALUATION OF NUCLEAR WASTE DISPOSAL BY UNDERGROUND IN SITU MELTING,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5E.
W75-08785

HYDRAULIC ENGINEERING AND THE ENVIRONMENT.
For primary bibliographic entry see Field 8B.
W75-08786

ENVIRONMENTAL IMPACTS OF RESERVOIRS--A CASE STUDY,
Stanford Univ., Calif. Dept. of Civil Engineering.
L. Ortolano.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 93,-104, 1973. 1 fig, 6 ref. Army Contract DACW 31-71-C-0127.

Descriptors: *Dams, *Reservoirs, *Environmental effects, Rivers, Water supply, Flood control, Multiple-purpose projects, Feasibility studies, Investigations, Construction, *California.
Identifiers: *Environmental impact statements, Carmel River(Calif), Case studies.

A case study dealing with the analysis of environmental impacts for three alternative reservoir projects proposed for the Carmel River in California was summarized. The alternative actions involved in the case study were realistic inasmuch as they closely resemble those that are currently being examined by the U.S. Army Corps of Engineers and

others. The case study effort was intentionally restricted to an examination of the following three alternative actions: (1)In the absence of an action by the Corps of Engineers, the local utility would construct a single purpose water supply reservoir at the San Clemente site; (2)San Clemente Project involves construction of a multipurpose dam at the San Clemente site by the Corps of Engineers; (3)Klondike Project involves construction of a dam at the Klondike site by the Corps of Engineers. Impacts were examined relating to construction activities; inundation of structures and roads; inundation of free flowing streams; inundation of cultural, historic, and archeologic features; biological systems; and visual changes. (See also W75-08786) (Sims-ISWS)
W75-08796

7. RESOURCES DATA

7A. Network Design

SOME COMMENTS ON TESTING RANDOM TOPOLOGY STREAM NETWORK MODELS,
State Univ. of New York, Buffalo. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W75-08437

EVALUATION OF THE REPRESENTATIVE-NESS OF THE PRECIPITATION NETWORK IN RELATION TO THE SPATIAL INTERPOLATION OF PRECIPITATION,
For primary bibliographic entry see Field 2B.
W75-08444

AN EVALUATION OF THE ERTS DATA COLLECTION SYSTEM AS A POTENTIAL OPERATIONAL TOOL,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-08503

PROCESS IN DATA COLLECTION AND DISSEMINATION IN WATER RESOURCES, 1964-1974,
Geological Survey, Reston, Va. Office of Water Data Coordination.
R. H. Langford, and W. W. Doyel.
In: A Decade of Progress in Water Resources: American Water Resources Association Proceedings Series No 19, p 161-167, March 1974. 1 ref.

Descriptors: *Data collections, *Hydrologic data, *Information exchange, Data storage and retrieval, Documentation, Networks, Federal government.

Considerable progress has been made in the ability to collect and handle water-resources data, but we have not yet appreciably improved the ability to assure that the data user's needs are satisfied by the delivery of the proper data in the right form and the right time frame to meet his specific requirements. In 1964 the Department of the Interior was instructed by the Bureau of the Budget to initiate activities leading to the coordination of the acquisition of water data by Federal agencies. Recognition of, and improved communication with, a new, expanded, user community coupled with the development of new information products will help meet their needs. Data acquisition methodologies are being developed to permit various data to be utilized and evaluated in conjunction with each other, no matter what the source of those data may be. Indexing techniques are being implemented to assure availability of data. The voluntary participation of the data organizations is promoted in such an effort. (Knapp-USGS)
W75-08505

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
R. K. Knott.
Open-file report, April 1975. 19 p, 1 tab.

Descriptors: *Discharge(Water), *Discharge measurement, *Streamflow, *Arkansas, *Basic data collections, Hydrologic data, Monitoring, Water quality.

Discharge data are presented for a network of water-quality monitoring stations operated throughout Arkansas. Most of the stations are at points where discharge records are not otherwise collected. (Knapp-USGS)
W75-08519

DESIGN AND IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL, 1971-74,
Geological Survey, Reston, Va.
M. D. Edwards, W. L. Isherwood, and R. N. Eicher.
Open-file report, April 1975. 201 p.

Descriptors: *Data processing, *Basic data collections, *Data storage and retrieval, *Hydrologic data, Data collections, Streamflow, Computer programs, South America, Information retrieval.
Identifiers: *Brazil.

Streamflow records have been collected intermittently for over a half a century by numerous Brazilian organizations, both governmental and private. The responsibility for the national hydrological data collection program is vested in the Projeto Hidrologia, Departmento Nacional de Aguas e Energia Eletrica (DNAEE), Ministerio das Minas e Energia (MME). The DNAEE requested assistance of the U.S. Geological Survey (USGS) in the design and implementation of a hydrologic information system for automatic processing of Brazilian streamflow records. The plans and procedures for the design and implementation of a hydrologic-data processing system of high transfer value that can be adapted to similar hydrologic environments elsewhere are described. (See W75-08524 thru W75-08527) (Knapp-USGS)
W75-08523

COMPUTER PROCESSING HYDROLOGIC DATA IN BRAZIL,
Geological Survey, Reston, Va.
W. L. Isherwood.
In: Design and Implementation of a Hydrologic Data Processing System in Brazil, 1971-74: Geological Survey open-file report, p 1-11, April 1975. 3 append.

Descriptors: *Data processing, *Data storage and retrieval, *Hydrologic data, Computer programs, South America.
Identifiers: *Brazil.

For computer processing of hyhydrologic data in Brazil, techniques developed by the USGS in the United States were adapted to conditions prevailing in Brazil. A system of numerical identification for sites of hydrologic data collection for both on-stream sites and off-stream sites and generalized format for computer based storage for hydrologic data were recommended. In addition, it was recommended that an exchange of computer trained personnel both from the USA to Brazil and from Brazil to the USA, be planned in order to carry out the conversions of computer programs to a form useful in Brazil. (See also W75-08523) (Knapp-USGS)
W75-08524

HYDROLOGIC DATA PROCESSING SYSTEM FOR BRAZIL,
Geological Survey, Reston, Va.
M. D. Edwards.

In: Design and Inplementation of a Hydrologic Data Processing System in Brazil, 1971-74: Geological Survey open-file report, p 12-98, April 1975. 9 fig, 3 append.

Descriptors: *Data storage and retrieval, *Hydrologic data, Data processing, Computer programs, South America.
Identifiers: *Brazil.

Recommendations are given for the establishment of a processing system for hydrologic data in the Ministerio das Minas e Energia, Brazil. A primary effort in the use of this system is the processing of large volumes of historical hydrologic data in the Departamento Nacional de Aguas e Energia Eletrica. (See also W75-08523) (Knapp-USGS)
W75-08525

THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,
Geological Survey, Reston, Va.
M. D. Edwards.
In: Design and Implementation of a Hydrologic Data Processing System in Brazil, 1971-74: Geological Survey open-file report, p 99-157, April 1975. 6 fig, 2 ref.

Descriptors: *Data storage and retrieval, *Hydrologic data, Data processing, Computer programs, South America.
Identifiers: *Brazil.

The formats and file structures of the National Water Data Storage and Retrieval System of the U.S. Geological Survey were used in the implementation of the Hydrologic Information System (HIS) in Brazil. In addition to the Daily Values File, the system contains a Station Inventory File which contains pertinent information related to the geographic location, period of record available and types of data available for each station. (See also W75-08523) (Knapp-USGS)
W75-08526

MANAGEMENT STUDY OF SOME ASPECTS OF SISTEMA DE INFORMACOES HIDROLOGICAS,
Geological Survey, Reston, Va.
R. N. Eicher.
In: Design and Implementation of a Hydrologic Data processing System in Brazil, 1971-74: Geological Survey open-file report, p 158-201, April 1975. 6 fig, 5 tab.

Descriptors: *Data processing, *Data storage and retrieval, *Hydrologic data, Basic data collections, Computer programs, South America, Information retrieval.
Identifiers: *Brazil.

A management study was made of the flow of data between the several organizations that are concerned with the collection, compilation, processing, analysis and publication of the basic hydrologic data in Brazil. (See also W75-08523) (Knapp-USGS)
W75-08527

THE SEASONAL VARIATION OF THE HYDROLOGIC CYCLE AS SIMULATED BY A GLOBAL MODEL OF THE ATMOSPHERE,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2A.
W75-08704

CHANNEL AGGRADATION IN WESTERN UNITED STATES AS INDICATED BY OBSERVATIONS AT VIGIL NETWORK SITES,
Geological Survey, Boise, Idaho. Water Resources Div.
For primary bibliographic entry see Field 2J.
W75-08830

7B. Data Acquisition

CLASSIFICATION AND WORLD DISTRIBU-
TION OF VEGETATION RELATIVE TO
V/STOL AIRCRAFT OPERATIONS,
Army Engineer Topographic Labs., Fort Belvoir,
Va.
W. C. Robison, and J. Viletto, Jr.
Report No ETL-SR-74-4, December, 1973. 30 p, 8
fig, 1 map, 18 ref.

Descriptors: *Vegetation, *Distribution, *Deserts,
*Aquatic plants, *Irrigation, *Aircraft, Climatic
zones, Trees, Shrubs, Tundra, Cultivated lands,
Classification, Grassland.

Vegetation was considered in regard to effects on
the operation of V/STOL aircraft and classified
into nine formation-classes: closed forest, open
forest and woodland, savanna, treeless grassland,
closed shrubs, sparse woodland and scrub, vegeta-
tion sparse to absent (without trees), aquatic
vegetation and cultivated vegetation in short plant-
ing cycles. The sparse or absent vegetation catego-
ry occupies the most extensive area of the earth
and includes the low latitude deserts, the Arctic
tundra, the entire Antarctic continent, and all the
other areas that for some reason have little or no
vegetation. This class is also least affected by cul-
tivation. In addition to the development of a
vegetation classification for V/STOL aircraft
operations, this study produced a world vegetation
map using the developed classification. (Mastic-
Arizona)
W75-08366

ARIZONA SCANNED BY ERTS-1.
Geotimes, Vol 19, No 9, p 24, September 1974. 1
fig.

Descriptors: *Arizona, *Remote sensing, *Terrain
analysis, *Aerial reconnaissance, Infrared radia-
tion, Colorado River, Satellites(Artificial).
Identifiers: ERTS-1.

A mosaic of Arizona was assembled by U.S.
Geological Survey scientists using 24 images tqken
by NASA's Earth Resources Technology Satellite.
Boundaries between land and water are especially
sharp. Desert land appears white; forests dark.
The Colorado River can be traced along its course
through the state. Prominent features such as the
Black Mesa in the northeast, the White Mountains
and Baldy Peak in the eastern portion of the state,
Phoenix, Tucson, and the Santa Cruz and Gila
Rivers in the South central part of the state are
distinct. (Mastic-Arizona)
W75-08367

REMOTE   SENSING   OF   NATURAL
RESOURCES, THE ROLE OF UNESCO'S
RESOURCES RESEARCH PROGRAMME.
Nature and Resources, Vol 10, No 1, p 18-20,
January-March 1974.

Descriptors: *Remote sensing, *Aerial photog-
raphy, *Satellites(Artificial), *Data collections,
International Hydrological Decade, Hydrologic
data, Surveys.

The use of remote sensing from satellites and
rockets constitutes a new tool of environmental
and natural resources research, particularly when
it is necessary to survey or monitor large areas of
the Earth's surface. While it seems unlikely that
Unesco can contribute to design of satellite-borne
remote sensing equipment, a more significant role
may be the interpretation of satellite data and their
use for practical purposes. Contributions may be
made toward problems that cannot be solved
without cooperation and collaboration between
launching countries and those countries covered
by satallite surveys. Unesco has a definite interest
in the development of space techniques such as
remote sensing, and could provide input for

establishing and maintaining international
cooperation in order to promote their use.
Hydrological studies, small-scale mapping of soils
and vegetation types, mapping and studies of
geological and geomorphological features, mea-
surement of ocean temperature, turbidity, pollu-
tion, etc., are examples. (Mastic-Arizona)
W75-08368

STEAM, HOT-WATER AND ELECTRICAL
THERMAL DRILLS FOR TEMPERATE
GLACIERS,
Centre National de la Recherche Scientifique,
Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W75-08409

RADIO SOUNDINGS ON TRAPRIDGE GLACI-
ER, YUKON TERRITORY, CANADA,
Department of the Environment, Calgary
(Alberta). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W75-08412

A MEASUREMENT OF SURFACE-PERPEN-
DICULAR STRAIN-RATE IN A GLACIER,
Washington Univ., Seattle. Geophysics Program.
For primary bibliographic entry see Field 2C.
W75-08416

RADIO ECHO SOUNDING ON TEMPERATE
GLACIERS,
Water Management Service, Calgary (Alberta).
For primary bibliographic entry see Field 2C.
W75-08419

EVOLUTION OF GULF STREAM EDDIES AS
SEEN IN SATELLITE INFRARED IMAGERY,
National Environmental Satellite Service,
Washington, D.C.
For primary bibliographic entry see Field 2L.
W75-08429

SATELLITE DETECTION OF UPWELLING IN
THE GULF OF TEHUANTEPEC, MEXICO,
National Environmental Satellite Service,
Washington, D.C.
For primary bibliographic entry see Field 2L.
W75-08430

THE CHALK GROUNDWATER TRITIUM
ANOMALY--A POSSIBLE EXPLANATION,
Institute of Geological Sciences, London
(England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2F.
W75-08449

INVESTIGATION OF VERTICAL GROUND-
WATER FLOW IN BOREHOLES,
International Hydrological Decade, New Delhi
(India). Indian National Committee.
For primary bibliographic entry see Field 2F.
W75-08450

SOME CHARACTERISTICS OF THE ALBEDO
OF SNOW,
Utah State Univ., Logan. Dept. of Soil Science
and Biometeorology.
For primary bibliographic entry see Field 2C.
W75-08452

A SIMPLE RESPIROMETER FOR MEASURING
OXYGEN AND NITRATE CONSUMPTION IN
BACTERIAL CULTURES,
Agricultural Univ., Wageningen (Netherlands).
Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W75-08458

MEASUREMENT OF THE HORIZONTAL COM-
PONENT OF GROUND WATER FLOW USING
A VERTICALLY POSITIONED IN-SITU THER-
MAL PROBE,
New Mexico Inst. of Mining and Technology,
Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 2F.
W75-08490

SIMPLE AERATOR SOLVES PROBLEMS.
For primary bibliographic entry see Field 5D.
W75-08542

FLOW-THROUGH APPARATUS FOR ACUTE
TOXICITY BIOASSAYS WITH AQUATIC IN-
VERTEBRATES,
Fisheries and Marine Service, Winnipeg
(Manitoba). Aquatic Toxic Studies Div.
For primary bibliographic entry see Field 5A.
W75-08563

PHYSICAL   CRITERIA   IN   COMPUTER
METHODS FOR PARTIAL DIFFERENTIAL
EQUATIONS,
Rutgers - the State Univ., New Brunswick, N.J.
Dept. of Computer Science.
For primary bibliographic entry see Field 5G.
W75-08593

GEOELECTRICAL POSSIBILITIES OF DE-
TECTING STREAM CHANNELS IN CAR-
BONATE ROCKS,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 2F.
W75-08603

WATER   TURBIDITY   MEASURING   AP-
PARATUS,
Fishmaster Products, Inc., Tulsa, Okla. (assignee)
L. L. Harcrow, Jr.
US Patent No 3,876,312, 3 p, 5 fig, 3 ref; Official
Gazette of the United States Patent Office, Vol
933, No 2, p 767, April 8, 1975.

Descriptors: *Patents, *Turbidity, Water proper-
ties, Water pollution, Water pollution control,
*Light intensity, *Optical properties, Water quali-
ty, Measurement, Instrumentation, *Pollutant
identification.

A water turbidity measuring apparatus is designed
and constructed for determining the light intensity
level at various depths of water relative to the am-
bient surface light intensity. A light sensitive probe
is lowered to various depths in the water by means
of a flexible cable. The opposite end of the flexible
cable is secured to and operably connected to a
control for determining and displaying the percent-
age of light present at the various depths of water
with respect to the surface ambient light. This con-
trol comprises a meter having a dial which is grad-
uated from 0 to 100 percent and an ambient sur-
face light adjustment mechanism connected to the
meter for setting the meter to read one hundred
percent when the probe is exposed to the ambient
light surface of the water. The flexible cable is pro-
vided with spaced graduation markers so that as
the probe is lowered into the water, reference to
the flexible cable by the user indicated the depth
of the probe. As the probe is lowered into the
water the user may refer to the meter and deter-
mine the percentage of light present at the probe in
relation to the various depths of the probe. (Sinha-
OEIS)
W75-08626

UNDERWATER HOUSE,
B. Ehlers.
US Patent No 3,875,753, 3 p, 2 fig, 4 ref; Official
Gazette of the United States Patent Office, Vol
933, No 2, p 577, April 8, 1975.

Descriptors: *Patents, Underwater, Facilities, Equipment.
Identifiers: *Underwater houses, *Underwater facilities, Divers, Decompression chamber.

An underwater house enclosure has a flexible, shaped, inflatable skin closed tightly on all sides with the exception of a bottom opening. A collapsible framework supports the skin. The underwater house can be folded in the manner of a tent and transported. It provides divers with secure protection to a depth of about ten meters and may be used for submarine observations or as a decompression chamber. (Sinha-OEIS)
W75-08630

RESPONSES OF THE THREE TEST ALGAE OF THE ALGAL ASSAY PROCEDURE: BOTTLE TEST,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
For primary bibliographic entry see Field 5A.
W75-08710

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURE,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
F. H. Stephan, and R. A. Elmiger.
U S Patent No 3,878,456, 6 p, 11 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 933, No 3, p 1442, April 15, 1975.

Descriptors: *Patents, *Measurement, *Conductivity, *Instrumentation, Chemical properties, Water properties, Water quality, Physical properties, Sea water, *Salinity, Temperature, *Water temperature.
Identifiers: Sensors.

A standard conductivity cell has concentric thin-walled alumina cylinders of different lengths for ease of manufacture. It contains a thin film or layer of standard seawater of known predetermined parameters between the cylinders. Electrical contact is made to the standard seawater by end electrodes and a pressure compensation arrangement allows for the cell's use at great depths in the water. With a known relationship between conductivity and temperature, the cell also operates as a very rapid temperature sensor. (Sinha-OEIS)
W75-08760

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-08813

METER FOR SEWER FLOW MEASUREMENT,
Illinois Univ., Urbana. Dept. of Civil Engineering.
H. G. Wenzel, Jr.
Journal of the Hydraulics Division, ASCE, Vol 101, No HY1, Proceedings paper No 11070, p 115-133, January 1975. 11 fig, 3 tab, 18 equ, 17 ref. OWRT B-063-ILL(3).

Descriptors: *Discharge(Water), *Measurement, *Flowmeters, *Hydraulics, *Pipe flow, Sewers, Open channel flow, Equations, Drainage, Water resources, Management, Water pollution control.
Identifiers: Urban development.

Urban runoff data are valuable as input to urban water resource management decisions for the calibration and testing of urban simulation models and for the development and operation of urban wastewater control systems. Given are the characteristics of an ideal sewer flow meter. Reported is an experimental and analytical study performed to develop the geometry for a Venturi type flow

meter for use in sewer flow measurement. The meter consists of a constriction in the pipe which produces critical flow under open channel flow conditions and acts as a conventional Venturi meter under full flow conditions. The constriction is constructed using cylindrical segments, the diameter of which is larger than that of the pipe, leaving the invert and crown clear. Head loss characteristics and experimental rating curves for both open channel and full flow conditions are described. Information is presented to permit the selection of geometrical parameters for optimum performance for a specific installation. A Venturi type flow meter for measurement of sewer flows under both open channel and full flow conditions is feasible. Its advantages are low cost and simple operation. (Bell-Cornell)
W75-08850

7C. Evaluation, Processing and Publication

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME I: COMPLETION REPORT,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 6A.
W75-08352

URBAN WATER DEVELOPMENT AND MANAGEMENT IN ARID ENVIRONMENTS, VOLUME II: THE WATER GAME--GAMING SIMULATION FOR URBAN WATER RESOURCES PLANNING,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 6A.
W75-08353

REPORT AND INTERPRETATIONS FOR THE GENERAL SOIL MAP OF PIMA COUNTY, ARIZONA,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 2G.
W75-08373

PROBIT TRANSFORMATION: IMPROVED METHOD FOR DEFINING SYNCHRONY OF CELL CULTURES,
Carnegie Institution of Washington, Stanford, Calif. Dept. of Plant Biology.
For primary bibliographic entry see Field 5A.
W75-08378

HYDROGEOLOGY OF THE EDMONTON AREA (NORTHWEST SEGMENT), ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 4B.
W75-08398

HYDROGEOLOGY OF THE GLEICHEN AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 4B.
W75-08399

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W75-08404

TEMPERATURE MEASUREMENTS IN A TEMPERATE GLACIER,
Washington Univ., Seattle. Geophysics Program.
For primary bibliographic entry see Field 2C.
W75-08415

EMPIRICAL DATA ON LONGITUDINAL DISPERSION IN RIVERS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W75-08495

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS-OKLAHOMA, 1972: 1974 WATER YEAR,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W75-08497

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1972-73,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W75-08498

BASIC GROUND-WATER DATA FOR THE MOSCOW BASIN, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2F.
W75-08499

AN EVALUATION OF THE ERTS DATA COLLECTION SYSTEM AS A POTENTIAL OPERATIONAL TOOL,
Geological Survey, Harrisburg, Pa.
R. W. Paulson.
In: Third Earth Resources Technology Satellite-1 Symposium, Vol 1: Technical Presentations, Section B, Goddard Space Flight Center, Dec 10-14, 1973, Washington, D.C.: National Aeronautics and Space Administration Report SP-351, p 1099-1111, Paper W8, 1974. 5 fig, 4 ref.

Descriptors: *Data transmission, *Telemetry, *Satellites(Artificial), *Data collections, Instrumentation, Monitoring, Streamflow, Water quality, Water levels.
Identifiers: *ERTS.

The Earth Resources Technology Satellite (ERTS) data collection system is a reliable and simple system for collecting data from U.S. Geological Survey operational field instrumentation. It is technically feasible to expand the ERTS system into an operational polar-orbiting data-collection system to gather data from the Geological Survey's hydrologic data network. This could permit more efficient internal management of the network, and could enable the Geological Survey to make data available to cooperating agencies in near-real time. The Geological Survey is conducting an analysis of the costs and benefits of satellite data-relay systems. (Knapp-USGS)
W75-08503

PROCESS IN DATA COLLECTION AND DISSEMINATION IN WATER RESOURCES, 1964-1974,
Geological Survey, Reston, Va. Office of Water Data Coordination.
For primary bibliographic entry see Field 7A.
W75-08505

ESTIMATED YIELD OF FRESH-WATER WELLS IN FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Pascale.
Florida Bureau of Geology, Tallahassee, Map Series No 70, 1975. 1 sheet, 1 fig, 1 map, 15 ref.

Descriptors: *Groundwater resources, *Aquifers, *Groundwater availability, *Florida, Aquifer characteristics, Wells, Geology, *Maps, Pumping, Water supply, Groundwater movement.

This one-sheet map report depicts the great geographical variation of well yield for four major

aquifers used to supply potable water in Florida. (1) Wells that tap the Floridan aquifer--the most extensive and widely used aquifer--generally yield at least 250 gal/min throughout the State except for a few areas. In general wells that yield at least 1,000 gal/min tap limestone containing interconnected solution cavities. In northwest Florida, wells inland have greater yields because the Floridan aquifer along the coast contains much limey clay and sand, which reduce its transmissivity. (2) The Biscayne aquifer, underlying Dade and Broward and part of Palm Beach Counties, is the prime source of water for populous southeast Florida. The aquifer is composed mainly of limestone, coquina, coralline reef rock, and sand, and is highly productive; well yields commonly exceed 2,000 gal/min. (3) Except along the coast, in Escambia and Santa Rosa Counties, wells yield 250 gal/min or more. Along the coast the aquifer is less than 250 feet thick and contains clay beds that reduce the transmissivity. Wells there yield less than 250 gal/min. (4) Wells that tap the shallow aquifer along the east coast generally yield less than 250 gal/min because the aquifer in that area consists of sediments of low permeability. The shallow aquifer in northern Collier and southern Hendry Counties is composed of highly permeable limestone; wells in this area generally yield at least 2,000 gal/min. (Woodard-USGS)
W75-08507

FLOOD ON BUFFALO CREEK FROM SAUNDERS TO MAN, WEST VIRGINIA,
Geological Survey, Reston, Va.
G. S. Runner.
For sale by US Geol. Survey, Reston, Va 22092 - Price $1.50 per set. Hydrologic Investigations Atlas HA-547, 1974. 2 sheets, 13 fig, 4 tab, 2 ref.

Descriptors: *Floods, *Coal mine wastes, *West Virginia, *Dam failure, Disasters, Water quality, Water levels, Damages, *Maps.
Identifiers: *Buffalo Creek(W Va).

On February 26, 1972, at approximately 8 a.m., a coal mine refuse dam collapsed on Middle Fork, a tributary to Buffalo Creek, West Virginia. This 1-sheet hydrologic atlas report documents the hydrologic events associated with the Buffalo Creek disaster as an aid in planning remedial measures to reduce potential flood hazards from similar dams and impoundments. This most destructive flood in West Virginia's history swept through 15.3 miles of the Buffalo Creek valley at an average speed of 7 feet per second (5 miles per hour) and reached the town of Man at the mouth of Buffalo Creek around 11 a.m. The travel time for the 15.3 miles was about 3 hours. During the 3-hour cascade down the valley at least 118 lives were lost, 500 homes were destroyed, 4,000 people were left homeless, property damage exceeded $50 million and highway damage exceeded $15 million. (Knapp-USGS)
W75-08508

GROUND-WATER CONDITIONS IN THE FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Reston, Va.
G. A. Brown, and O. J. Cosner.
For sale by U.S. Geol. Survey, Reston, Va 22092 - $1.25 per set. Hydrologic Investigations Atlas HA-538, 1974. 3 sheets, 13 ref.

Descriptors: *Drawdown, *Saline water intrusion, *Aquifers, *Virginia, Withdrawal, Water yield, Salinity, Path of pollutants, Groundwater movement, Hydrogeology, *Maps.
Identifiers: *Franklin(Va).

During the past 30 years large quantities of groundwater have been withdrawn at Franklin, Virginia, and a cone of depression has formed in the water level of the Lower Cretaceous aquifer. This cone extends westward to the Fall Line,

coalesces to the north and east with other small cones caused by pumping, and reaches southward into North Carolina. The water-level decline has caused concern about the future groundwater supplies. This 3-sheet hydrologic atlas presents the results of a field investigation of geology and hydrology and an interpretation of the aquifer systems in the Franklin area. Water levels have declined as much as 185 feet near the center of the cone since 1937-39. Water with relatively high concentrations of chloride is known to be present in the aquifer in the southeastern corner of the study area and to the east. Movement of water in the aquifer is toward Franklin. Water in the Lower Cretaceous aquifer in most of the Franklin area is of excellent quality for domestic, municipal, and most industrial uses. (Knapp-USGS)
W75-08509

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE CHERRYFIELD-JONESBORO AREA, MAINE,
Geological Survey, Reston, Va.
G. C. Prescott, Jr.
For Sale by USGS, Reston, Va 22092 - Price $1.00. Hydrologic Investigations Atlas HA-529, 1974. 1 sheet, 27 ref.

Descriptors: *Groundwater, *Water resources, *Maine, *Maps, Hydrogeology, Water yield, Water quality, Hydrologic data.
Identifiers: *Cherryfield(Maine), *Jonesboro(Maine).

This 1-sheet hydrologic atlas describes the geologic and hydrologic conditions governing the occurrence of groundwater in the Cherryfield-Jonesboro area, Maine. The magnitude of yields that might be expected from properly located and constructed wells or from springs is indicated by the map showing groundwater-favorability areas and surficial geology. This map gives a generalized interpretation of observed geologic and hydrologic data and provides a logical basis for directing detailed exploration for groundwater. The quality of groundwater is generally good for most purposes. It is normally soft, low in dissolved solids and in most areas is free from constituents that would limit its usefulness. The depth of 487 bedrock wells ranged from 27 to 600 feet. The average was 150 feet and the median 145 feet. A few of the wells were drilled for industrial or commercial use, but most were drilled for domestic purposes. The yield of wells ranged from less than 1 to 250 gpm. About 5 percent of the wells yielded more than 30 gpm, and yields exceeding 50 gpm were reported from several depth ranges. The largest reported yield, 250 gpm, was from a well 130 feet deep. (Knapp-USGS)
W75-08510

WATER RESOURCES OF THE CROW RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
G. F. Lindholm, D. F. Farrel, and J. O. Helgesen.
For Sale by U.S. Geological Survey, Reston, Va 22092, Price $2.25 per set. Hydrologic Investigations Atlas HA-528, 1974. 3 sheets, 17 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Minnesota, Hydrogeology, Hydrologic data, *Maps, Water quality, Water yield, Aquifers.
Identifiers: *Crow River(Minn).

The water resources of the Crow River watershed, Minnesota, an area of about 2,760 square miles are discussed in a 3-sheet hydrologic atlas. The area is covered entirely by glacial deposits. A topographically high, east-west-trending end moraine divides most of the watershed into two drainage areas of approximately equal size. The North Fork Crow River drains a mixture of glacial outwash and till deposits, whereas the South Fork Crow River drains chiefly till deposits. Cambrian and Precam-

brian sedimentary rocks underlie the glacial drift in the eastern part of the watershed. Cretaceous sedimentary rocks, through discontinuous, are present in part of the western two-thirds of the watershed. Average annual precipitation (1939-69) on the watershed is 27.6 inches. Of this amount, 24.2 inches is discharged as evapotranspiration, 3.3 inches as streamflow, and 0.1 inch as underflow. Water use in the watershed exceeded 8 billion gallons in 1969. Nearly all water is obtained from groundwater sources, mainly glacial drift. All major aquifers can support additional development. The productivity, lateral continuity, and partly overlapping occurrence of these units in the eastern part of the watershed are favorable to groundwater development in that area. Small tributary streams in the watershed often go dry in the fall and winter because they have little natural storage and receive little groundwater contribution. Sites for large storage reservoirs are limited to lower reaches of the North and South Forks of the Crow River. Most water in the watershed is very hard, moderately to highly mineralized, and of the calcium magnesium bicarbonate type. (Knapp-USGS)
W75-08511

RECONNAISSANCE OF THE UPPER AU SABLE RIVER, A COLD-WATER RIVER IN THE NORTH-CENTRAL PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Reston, Va.
G. E. Hendrickson, and C. J. Doonan.
For Sale by USGS, Reston Va. 22092 Price $1.00. Hydrologic Investigations Atlas HA-527, 1974. 1 sheet, 11 ref.

Descriptors: *Rivers, *Recreation, *Michigan, Fishing, Boating, Streamflow, Water resources, Hydrologic data, *Maps, Water quality.
Identifiers: *Au Sable River(Mich).

The Au Sable River is one of Michigan's most popular trout streams and canoe trails. At present, interests of the different recreationists (fishermen, canoers, campers, and riverside property owners) conflict. The conflict results from the fact that the recreational potential is limited by the hydrologic characteristics of the river--its streamflow, quality of water, and character of stream channel, bed, and banks. The purpose of this 1-sheet hydrologic atlas is to describe these characteristics and to show how they relate to the recreational potential of the stream. The watershed of the upper Au Sable is underlain chiefly by glacial moraine and outwash deposits. The outwash deposits are composed mainly of sand and gravel, and the soils overlying them are composed for the most part of sand. The moraines also are generally sandy, but contain some silt and clay, and the overlying soils also contain some silt and clay in places. A table summarizes the streamflow characteristics of the Au Sable and shows how these relate to recreational potential. A table summarizes the quality-of-water characteristics of the Au Sable River and shows how there characteristics are related to the recreational potential of the river. (Knapp-USGS)
W75-08512

WATER RESOURCES OF THE BLUE EARTH RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,
Geological Survey, Reston, Va.
H. W. Anderson, Jr, D. F. Farrell, and W. L. Broussard.
For sale by U.S. Geological Survey, Reston, Va. 22092 Price $1.25 per set. Hydrologic Investigations Atlas HA-525, 1974. 3 sheets, 7 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Minnesota, Hydrogeology, Hydrologic data, *Maps, Water quality, Water yield, Aquifers.
Identifiers: *Blue Earth River(Minn).

The water resources of Blue Earth River watershed in Minnesota are described in a 3-sheet hydrologic atlas. The watershed includes 3,106 square miles of land surface, which varies from fairly flat to gently rolling. The western, southern, and eastern boundaries are end moraines formed by Pleistocene glaciers. In their lower reaches major streams have cut through glacial deposits and into underlying bedrock. Water supplies are obtained from wells tapping Pleistocene glacial deposits, Ordovician and Cambrian sedimentary rocks, and Precambrian crystalline rocks. In the western part of the watershed, glacial sand and gravel (generally buried) form the most accessible and widely used aquifers. Toward the east, increasing numbers of wells obtain water from Ordovician and Cambrian rocks. Most of the Blue Earth River watershed is an area of groundwater recharge. The use of groundwater in the watershed is estimated at 6,428 million gallons per year. At present, no areas of significant groundwater decline are known, indication that only part of the available groundwater has been developed. Surface water provides excellent year-round recreational facilities and habitat for fish and wildlife. Sites for large storage reservoirs are limited to lower reaches of the rivers. The small tributary streams in the watershed go dry during the fall and winter in may years because they have little natural storage and little groundwater contribution. (Knapp-USGS)
W75-08513

WATER RESOURCES OF THE CLINTON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Reston, Va.
J. O. Nowlin.
For sale by U.S. Geological Survey, Reston, Va. 22092 Price $1.00 per set. Hydrologic Investigations Atlas HA-469, 1973. 2 sheets, text, 10 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Michigan, Hydrologic data, Hydrogeology, Water yield, *Maps, Water quality, Aquifers.
Identifiers: *Clinton River(Mich).

This hydrologic atlas provides information on the physical features of the Clinton River, Michigan, and its tributaries, the characteristics of streamflow, the quality of ground and surface water, and the availability of groundwater. The Clinton River rises in a chain of lakes near the northwest edge of the basin. The drainage system in the undulating uplands of the headwaters area is poorly developed, consisting of a series of interconnected lakes and marshes draining to the south. About 670 lakes and ponds are within the Clinton River basin, ranging in size from 1,280 acres to less than an acre. The population of the Clinton River basin is primarily urban and suburban. The population in 1970 was about 900,000, of which 760,000 (about 84 percent) was concentrated in incorporated cities of 14,000 or more. The largest city is Warren, with a 1970 population of 179,260. The surficial features of the Clinton River basin were formed by the action of glacial ice and melt waters on rock debris deposited by the ice sheets of the last glacial period. Outwash and deltaic deposits are generally well sorted and coarse grained and generally are excellent sources of water. Wells completed in the bedrock generally yield only small supplies of water, although large supplies may be obtained occasionally. (Knapp-USGS)
W75-08514

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1974,
Geological Survey, Helena, Mont.
M. V. Johnson, and R. J. Omang.
Open-file report, 1975. 170 p, 2 fig, 1 tab.

Descriptors: *Peak discharge, *Small watersheds, *Montana, *Basic data collections, Hydrologic data, Floods, Discharge(Water).

A program to investigate the magnitude and frequency of floods from small drainage areas in Montana was begun July 1, 1955. A total of 191 stations were in operation at the end of the 1974 water year. This, the twentieth annual report, is primarily a tabulation, of water year, of the annual peak stage and discharge at each crest-stage gaging station. Also, activities and progress made during the 1974 water year are summarized. Substantial peak flows occurred during the 1974 water year, however, storm patterns varied greatly. West of the divide record high flows in January were caused by combined snowmelt and rain. Peak flows in mountain areas east of the divide during January were caused by snowmelt without contributions from rain. In the prairie area peak flows were mostly caused by isolated rainstorms during the summer and spring. Peak flow of record was equaled or exceeded at 12 sites. (Knapp-USGS)
W75-08516

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7A.
W75-08519

DESIGN AND IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL, 1971-74,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08523

COMPUTER PROCESSING HYDROLOGIC DATA IN BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08524

HYDROLOGIC DATA PROCESSING SYSTEM FOR BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08525

THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08526

MANAGEMENT STUDY OF SOME ASPECTS OF SISTEMA DE INFORMACOES HIDROLOGICAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-08527

ENVIRONMENTAL GEOLOGY--AN AID TO GROWTH AND DEVELOPMENT IN LAUDERDALE, COLBERT AND FRANKLIN COUNTIES, ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
P. H. Moser, and L. W. Hyde.
Atlas Series 6, 1974. 45 p, 25 fig, 1 tab, 63 ref, 72 photo.

Descriptors: *Environmental engineering, *Geology, Water resources, *Energy, *Mineralogy, *Alabama, Environmental effects, Community development, Topography, Industries, Engineering geology, Surface waters, Groundwater, Water utilization, Water quality.
Identifiers: Lauderdale County(Ala), Colbert County(Ala), Franklin County(Ala).

A pictorial and graphical presentation of Lauderdale, Colbert, and Franklin Counties in northwestern Alabama was presented in conjunc-

tion with an explanatory text and tabular data on the geology, water and mineral resources, engineering geology, and associated factors. These are to be used by planners and developers for implementing immediate and long-range plans for the effective and orderly development of the area. (Scott-ISWS)
W75-08718

MADAM I--A NUMERIC METHOD FOR DESIGN OF ADSORPTION SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5D.
W75-08726

OPTIMAL CAPACITIES OF WATER SUPPLY RESERVOIRS IN SERIES AND PARALLEL,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Regional Science.
For primary bibliographic entry see Field 4A.
W75-08728

A TECHNIQUE FOR THE PREDICTION OF WATER DEMAND FROM PAST CONSUMPTION DATA,
Sheffield Univ. (England). Dept. of Control Engineering.
For primary bibliographic entry see Field 6D.
W75-08730

COMPUTER USE FOR RIVER REGULATION,
Corps of Engineers, Portland, Oreg. Reservoir Control Center.
For primary bibliographic entry see Field 4A.
W75-08776

BOUGUER GRAVITY ANOMALY MAP OF THE TEMECULA AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Garden Grove, Calif.
W. R. Moyle, Jr., and D. J. Downing.
Santa Margarita-San Luis Rey Watershed Planning Agency Map, 1975. 1 sheet, 1 map, 1 tab, 6 ref.

Descriptors: *Groundwater resources, *Water wells, *Maps, *California, Pumping, Water yield, Sedimentology, Aquifer characteristics, Gravity, Depth, Well data, Contours.
Identifiers: *Temecula area(Calif), Anomaly, Bouguer anomaly.

A Bouguer gravity anomaly map of the Temecula, Calif., area shows the general shape of the sedimentary basin, which is nearly surrounded by basement complex. The deepest part of the sedimentary basin exceeds 4,000 feet, but well drillers' logs indicate that the most permeable sedimentary deposits probably do not exceed 1,250 feet in thickness. A groundwater barrier across Buck Mesa is located between test wells. The pump-test data show that a dramatic change in permeability occurs across this barrier. One well has a specific capacity of 0.4 gallon per minute per foot, indicative of the low permeability of the material on the northeast side of the barrier. The specific capacity of wells on the southwest side of the barrier ranges between 5.8 and 31 gpm per foot and indicates a higher permeability of the material on this side of the barrier compared to that on the northeast side. (Woodard-USGS)
W75-08831

QUALITY OF PUBLIC WATER SUPPLIES OF NEW YORK, MAY 1972-MAY 1973.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5A.
W75-08832

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 2. WATER QUALITY RECORDS.
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 5A.
W75-08833

INDEX TO MAPS TO FLOOD-PRONE AREAS IN INDIANA,
Geological Survey, Indianapolis, Ind.
W. G. Weist, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 860, $3.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 48-74, March 1975. 27p.

Descriptors: *Floods, *Maps, *Indiana, Documentation, Information retrieval, Flood data, Flood frequency, Flood profiles.
Identifiers: *Flood-map index(Ind).

A listing of 487 flood maps for Indiana prepared by the U.S. Geological Survey through July 1974 is presented by county. The list provides information on the type of flooding depicted and the reliability of the delineation. The list was prepared from a computer file, and an available program allows retrieval of data by landline location, State and county, and Standard Metropolitan Statistical Area (SMSA). The file will be continuously updated. The landline location of a mapped flood area is referred to the standard Geological Survey quadrangle (nominally 7-1/2 or 15-minute quad) in which this area lies. The landline identification includes the mapping scale and latitude and longitude of the southeast corner of the quadrangle, as well as the quadrangle name. If the flood area lies in part of several quadrangles, the name, latitude-longitude, and scale of each quadrangle is listed in the computer file and in the index. The type of flood information available within the quadrangle area is described either by: the year in which the mapped area was flooded, 1937, for instance, or the frequency at which the delineated area is expected to be flooded, expressed as a recurrence interval in years (100-year, for example). (Woodard-USGS)
W75-08834

EVALUATION OF METHODS FOR ESTIMATING STREAM WATER QUALITY PARAMETERS IN A TRANSIENT MODEL FROM STOCHASTIC DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W75-08849

8. ENGINEERING WORKS

8A. Structures

FLOOD ON BUFFALO CREEK FROM SAUNDERS TO MAN, WEST VIRGINIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-08508

MODULAR EROSION CONTROL DEVICE,
H. Campbell.
US Patent No 3,875,750, 3 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 576, April 8, 1975.

Descriptors: *Patents, *Shore protection, *Erosion control, Deposition, Sedimentation, Bank protection, Diversion structures.
Identifiers: *Wave action.

A modular unit for marine use for preventing and reversing erosion of water from land subject to wave action is provided. The device has a central peak with at least one additional peak located for-

ward (toward the water) and of a lower height. The peaks are separated by depressions or valleys and are directed toward the water. The forward faces of the peaks are sloped toward the rear and the devices are placed adjacent the shoreline. Under the action of the waves, even heavy waves, the sloped configuration directs and deflects the waves generally upward and over the devices while the rear parts and the peak and valley configuration traps the sand and other solid material carried by the waves as it retreats thus preventing the washing away of sand from the shoreline area and in fact trapping incoming sand and thereby not only preventing additional erosion but actually building up additional ground by virtue of the trapped solid material. (Sinha-OEIS)
W75-08611

IRRIGATION CONTROL,
For primary bibliographic entry see Field 3F.
W75-08617

STORMWATER CONTROL KEY TO BAY POLLUTION SOLUTION.
For primary bibliographic entry see Field 5D.
W75-08671

HURRICANE SPURS SEWER RENOVATION.
For primary bibliographic entry see Field 5D.
W75-08672

SELF-CLEANING STORM OVERFLOW BASINS WITH MEANDER DUCT (SELBSTREINIGENDE REGENUBERLAUFBECKEN MIT SCHLANGENRINNE),
For primary bibliographic entry see Field 5D.
W75-08679

SAMPLE UNCERTAINTY IN FLOOD LEVEE DESIGN: BAYESIAN VERSUS NON-BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Hydrology and Water Resources Interdisciplinary Program.
L. Duckstein, I. Bogardi, F. Szidarovszky, and D. R. Davis.
Water Resources Bulletin, Vol 11, No 3, p 425-435, June 1975. 3 fig, 2 tab, 6 equ, 13 ref. 2 append.

Descriptors: *Flood control, *Levees, *Design, *Probability, *Hydraulic structures, *Hydrology, *Water resources, Safety factors, Cost-benefit analysis, Optimization, Sampling, Algorithms, Equations, Mathematical models, Systems analysis, *Risks.
Identifiers: *Economic analysis, *Bayesian methods, *Bayesian decision theory, Benefit-risk analysis.

Bayesian and non-Bayesian flood levee design methods that account for the uncertainty due to limited record length are compared using a case study. Flood protection is not a purely economic problem; however, the approach taken by the ASCE Task Force Committee (1973) is followed, whereby the vector character of flood damage is eliminated by assigning a dollar value to human life, suffering and inconvenience. The specific flood levee problem concerns determining the optimum design or redesign level of a levee which results from the trade-off between construction, maintenance, and operations costs, and expected flood losses, while explicitly considering uncertainty. The first method, Bayesian decision theory (BDT), imbeds the uncertainty in the parameters of the yearly peak stage into a loss function. The optimum design of the flood levee, called Bayes design, corresponds to the minimum expected loss, called Bayes risk. The second method, induced safety algorithm (ISA), computes a margin of safety to be added to either an existing levee or a levee designed by classical benefit-cost analysis.

The design decision is shown to fluctuate as different record lengths are considered. For short record lengths, BDT, which takes small sample bias into account, appears to yield a more conservative design than ISA. On the other hand, ISA, which is simple to implement, seems to be preferable to BDT for longer record lengths. (Bell-Cornell)
W75-08724

HYDRAULIC ENGINEERING AND THE ENVIRONMENT.
For primary bibliographic entry see Field 8B.
W75-08786

REHABILITATION OF A CHANNELIZED RIVER IN UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
J. R. Barton, and P. V. Winger.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 1-10, 1973. 8 fig, 19 ref.

Descriptors: *Channel improvement, *Rehabilitation, *Fish, Habitats, Check structures, Hydraulic structures, Gabions, Rocks, Channel flow, Water chemistry, Water temperature, Structures, Fish populations, Fish food organisms, Vegetation, Rivers, *Utah.

On a recent highway construction contract in Utah where the construction of Highway I-80 resulted in the channelization of several stretches of the Weber River, various types of instream rehabilitation structures were installed in the altered sections in an attempt to alleviate some of the detrimental effects of channelization. The influence of these structures on the hydrology and biology of the Weber River was evaluated. Six types of instream rehabilitation structures were installed in the altered sections of the river. Gabion deflectors (wire baskets filled with rocks) and check dams were placed in three sections and rock deflectors and check dams were placed in two sections. A concrete diversion dam used for irrigation purposes was placed in one section. Random rocks were installed in all sections. Water chemistry data were collected from water samples collected above and below the channelized areas. Macroinvertebrate (fish food) organisms were collected monthly. Fish population data were collected with use of electrofishing equipment. After a relatively short time, fish populations were the same in changed and unchanged areas. Fish food organisms colonized the channeled areas within a few months. The construction itself and the initially unstable substrate of the altered section caused a marked increase in erosion and turbidity but these were of relatively short duration and seemed to have little long term effect on the biology of the area. The water chemistry and water temperature were not altered by the channelization. (See also W75-08786) (Sims-ISWS)
W75-08787

SWIMMING PERFORMANCE OF ARCTIC GRAYLING,
Idaho Univ., Moscow. Dept. of Civil Engineering.
F. J. Watts, and C. MacPhee.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 11-20, 1973. 3 fig, 1 tab.

Descriptors: *Culverts, *Fish migration, *Fish behavior, Hydraulic structures, Fish barriers, Fish passages, Fish populations, Anadromous fish, Structures, Habitats, *Alaska, *Design criteria.
Identifiers: *Arctic Grayling.

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Design criteria were established for culverts which will insure the maintenance of fish populations in streams traversed by the proposed Alaska Pipe Line and its supporting highway. Poorly designed culverts can block or impede fish movement upstream. A diversion dam, a headgate and approach conduit, and a tiltable 24-inch diameter culvert and associated head box and tail box were constructed on Poplar Grove Creek in south central Alaska. The general procedure used for the culvert part of the study was to block the upstream migration of fish with the dam, seine or trap the fish in the creek, place the fish in the tail box below the culvert, record the number of successes or failures per size group for a holding period of not longer than one day for a particular slope and flow condition, then collect all fish and release them in the stream above the facility. Only preliminary data were reported, along with a general discussion of design considerations which would allow free passage of fish. (See also W75-08786) (Sims-ISWS)
W75-08788

GENERAL CONSIDERATIONS OF FLOW IN BRANCHING CONDUITS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8B.
W75-08805

COMBINING FLOW IN BRANCHES AND WYES,
Beck (R. W.) and Associates, Seattle, Wash.
For primary bibliographic entry see Field 8B.
W75-08806

FLOW THROUGH TRIFURCATIONS AND MANIFOLDS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08807

OVERFLOW SPILLWAY ENERGY DISSIPATION BY JET ASSISTED HYDRAULIC JUMP,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-08817

8B. Hydraulics

THE ESTIMATION OF (RHO) IN THE FIRST-ORDER AUTOREGRESSIVE MODEL: A BAYESIAN APPROACH,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-08387

ANALYSIS OF RESISTANCE OVER STAGGERED ROUGHNESS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and R.-M. Li.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 99, No HY11, p 2169-2174, November 1973. 3 fig, 2 tab, 5 ref. OWRR B-014-COLO(8), Grant 14-01-0001-1435.

Descriptors: *Roughness(Hydraulic), Regression analysis, Chezy equation, *Roughness coefficient, Open channel flow.

A general relationship satisfactorily predicts the resistance factor for a given combination of flow and roughness properties. The only pattern considered in this study is the staggered pattern. (Knapp-USGS)
W75-08394

A SCHEMATIZATION OF ONSHORE-OFFSHORE TRANSPORT,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W75-08401

EQUILIBRIUM PROFILES OF COARSE MATERIAL UNDER WAVE ATTACK,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W75-08402

HEAT TRANSFER AND FLUID MECHANICS OF THE THERMAL POLLUTION PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
For primary bibliographic entry see Field 5B.
W75-08599

REDUCING FLUID FRICTION WITH OKRA,
Clemson Univ., S.C.
For primary bibliographic entry see Field 8G.
W75-08605

NUMERICAL ANALYSIS OF WARM, TURBULENT SINKING JETS DISCHARGED INTO QUIESCENT WATER OF LOW TEMPERATURE,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-08684

CAVITATION DAMAGE SCALE EFFECTS--STATE OF ART SUMMARIZATION.
International Association for Hydraulic Research, Delft (Netherlands). Section for Hydraulic Machinery, Equipment and Cavitation.
Journal of Hydraulic Research, Vol 13, No 1, p 1-17, 1975. 50 ref.

Descriptors: *Cavitation, *Velocity, *Pressure, *Fluid mechanics, *Powerplants, Laboratory tests, Vapor pressure, Damages, Temperature, Surface tension, Flow, Hydraulics, *Reviews, Erosion, *Scaling.
Identifiers: *Scale effects, Cavitation index, Suppression pressure.

A state-of-the-art review of cavitation damage scale effects was made. The only general conclusion that could be drawn was that damage rate increases very strongly in most cases with increased velocity, pressure, or size when sigma is maintained constant. Damage rates in general are more sensitive to these parameters than to any others. The velocity damage exponent usually lies in the range 4-6, and the diameter exponent in the range 3-4. Considerable further systematic experimentation is required before these effects can be evaluated more precisely. Uncertainty in erosion scale effects is also due to the lack of any universally accepted criteria in the measure of damage parameters. Only damage intensities from rather identical eroding environments can really be compared at this time. (Singh-ISWS)
W75-08698

NONEQUILIBRIUM RIVER FORM,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-08700

A TWO LAYER FLOW THROUGH A CONTRACTION,
New South Wales Univ., Kensington (Australia). Water Research Lab.
K. K. Lai, and I. R. Wood.

Journal of Hydraulic Research, Vol 13, No 1, p 19-33, 1975. 5 fig, 8 ref.

Descriptors: *Density stratification, *Flow, *Withdrawal, *Pressure, Reservoirs, Flow control, Energy equation, Analytical techniques, Discharge(Water), Interfaces, Numerical analysis, Froude number, Hydraulics.
Identifiers: *Two-layer flow, Selective withdrawal, Stationary layers, Flow contractions.

The withdrawal from a reservoir of two layers through separate valves which are downstream of a contraction was described. The fluid was considered as inviscid and the flow gradually varied. The variations of flow profiles obtained were shown and the limitation that the contraction places on the total discharge and on the ratio of discharge from each layer was discussed. The total withdrawal rate for a given discharge ratio was limited and some particular discharge ratios were not attainable. The flow profile for the possible cases showed considerable variety. (Singh-ISWS)
W75-08701

THE EFFECT OF ROUGHNESS STRIPS OF TRANSVERSE MIXING IN HYDRAULIC MODELS,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Fischer, and T. Hanamura.
Water Resources Research, Vol 11, No 2, p 362-364, April 1975. 2 fig, 1 tab, 3 ref. NSF Grant GI-34932.

Descriptors: *Mixing, *Roughness(Hydraulic), *Prototypes, *Laboratory tests, *Turbulence, Flumes, Shear stress, Velocity, *Hydraulic models, Rhodamine, Open channel flow, Analysis, Model studies.
Identifiers: *Transverse mixing coefficient.

Most physical models are constructed with distorted scales, or different horizontal and vertical scales. For open channel flows in the prototype, the shear stress is primarily from the bottom. In distorted models, however, the resistance to flow is provided mainly by vertical strips because the bottom resistance is not sufficient to counteract the distorted slope. An experiment in a laboratory flume was conducted to measure the rate of transverse mixing in a flow with frictional resistance caused by strips. The transverse mixing coefficient was found to depend on the strip arrangement, the width of the strip, and the flow velocity. Agreement of transverse mixing between model and prototype is possible through a proper combination of strip widths and velocities, but such agreement needs to be investigated in each case. (Singh-ISWS)
W75-08708

SEEPAGE THROUGH OPENING IN CUTOFF WALL UNDER WEIR,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W75-08711

CHANNELIZATION: A SEARCH FOR A BETTER WAY,
North Carolina Univ., Charlotte. Dept. of Geography and Earth Sciences.
E. A. Keller.
Geology, Vol 3, No 5, p 246-248, May 1975. 3 fig, 16 ref.

Descriptors: *Channel improvement, *Beds, *Depth, Stream improvement, Channels, Channeling, Shape, Alluvial channels, Slopes, Width, Thalweg, Channel morphology, Erosion, Sedimentation, Flow, Riprap, Design criteria.
Identifiers: *Riffles, Channelization.

A reproduction of channel forms produced by natural fluvial processes will minimize some adverse effects of channelization. Design criteria intended to improve drainage or control flooding should, in many cases, include the construction of pools (deeps) and riffles (shallows). An optimal spacing of pools and riffles, averaging about six times the channel width, will improve the modified stream by providing a channel morphology that is relatively stable, biologically productive, and aesthetically pleasing. (Sims-ISWS)
W75-08714

AN APPROXIMATE INFINITE CONDUCTIVITY SOLUTION FOR A PARTIALLY PENETRATING LINE-SOURCE WELL,
Bureau de Recherches Geologiques et Minieres, Orleans (France).
For primary bibliographic entry see Field 4B.
W75-08715

THE CIVIL ENGINEER AND FIELD DRAINAGE,
Ministry of Agriculture, Fisheries and Food. Lincoln (England).
For primary bibliographic entry see Field 4A.
W75-08731

METHOD OF RECOVERING GEOTHERMAL ENERGY,
Mobil Oil Corp., New York. (assignee)
For primary bibliographic entry see Field 4B.
W75-08736

FLOATING BREAKWATER,
Bridgestone Tire Co. Ltd., Tokyo (Japan). (assignee)
S. Tazaki, and Y. Ishida.
U.S. Patent No. 3,864,920, 4 p, 16 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 558, February 11, 1975.

Descriptors: *Patents, *Breakwaters, *Shore protection, Specific gravity, Floating.
Identifiers: *Floating breakwaters, *Wave action, Synthetic resin foam.

A floating breakwater assembly is comprised of a number of substantially equally dimensioned, elongated, floating bodies each comprising a rigid hollow upper shell and a rigid hollow lower shell bonded together. Each upper shell projects upward and out of the water along its entire length to a height of at least one half of the average height of waves to be broken. Floatation material is contained within each hollow upper shell and ballast material is contained within each hollow lower shell in order to submerge them. Spaced elongated, rigid cylindrical members extend transversely of and between the floating bodies for bonding them together in a spaced assembly. Means are provided for mooring the assembly to the sea bottom so that the floating bodies are generally perpendicular to the direction of movement of the waves. The specific gravity of the overall assembly is from 0.15 to 0.75. (Sinha-OEIS)
W75-08746

PITLESS WATER SYSTEM,
T. B. Clark.
U.S. Patent No. 3,865,513, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 756, February 11, 1975.

Descriptors: *Patents, *Water supply, *Water wells, Frost, Groundwater, Casings, Pumps, Valves.
Identifiers: *Well casings, Submersible pumps, Constant pressure valve units.

A hidden water system has an open-ended non-pressurized shell buried in the ground with only the removable top above ground. The bottom portion is below the frost line and connected to a casting which in turn is connected to a well casing. A constant pressure valve unit is mounted in the bottom portion of the shell in fluid communication with a submersible pump in the well casing and also in fluid communication with a demand pipe through a spool-type adapter mounted within the casting, and with pump and valve controls at the top of the shell for controlling operation of the valve and the pump. (Sinha-OEIS)
W75-08750

FLOATING BREAKWATER SYSTEM,
Reid, Middleton and Associates, Inc., Edmonds, Wash. (Assignee).
J. O. Olsen.
U S Patent No 3,877,233, 5 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 933, No 3, p 1072, April 15, 1975.

Descriptors: *Patents, *Breakwaters, *Shore protection, Erosion, Equipment, Marinas, Pontoons.
Identifiers: *Wave action.

A floating breakwater array to dissipate wave action in a body of water comprises a plurality of individual similarly shaped pontoon modules secured and held in the array by a network of structural members to collectively form a grid pattern of vertical walls and openings. The grid pattern has a plurality of regularly spaced openings in mutually transverse first and second horizontal directions of the array. Anchoring means connected to the array secure it in a desired position in the body of water. The vertical walls and openings extend into the upper portion of the wave to interfere with the movement of fluid in the orbital flow under the wave crest. The pontoon modules each comprise vertical walls which form a generally rectangular central portion having oppositely disposed protuberant end sections. The vertical walls also form at least one protuberant side section which is located between the protuberant end sections and which extend laterally away from the central portion. (Sinha-OEIS)
W75-08756

HYDRAULIC ENGINEERING AND THE ENVIRONMENT.
Proceedings of the 21st Annual Hydraulics Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York. 1973. 466 p.

Descriptors: *Conferences, *Hydraulic engineering, *Environment, *Environmental effects, Hydraulic structures, Fish, Channel flow, Flow characteristics, Sedimentation, Sediment transport, Management, Flood plains, Reservoirs, Waves(Water), Streamflow, Flood peak, Water quality, Surface waters, Groundwater, Cooling water, Hydraulics, Aeration, Water temperature, Watersheds(Basins), Disasters.
Identifiers: Branching conduits, Urban environment.

The conference aim was to develop an awareness of the effects of new hydraulic information on the environment. The twelve broad subject areas discussed were channel flow requirements for fish, sedimentation related flow characteristics, environmental impact of flood plain management and reservoirs, flow and wave hydromechanics, stream temperature and cooling water research, branching conduits, surface water environmental factors, determination of sediment loads, water quality and hydraulics, predicting flood peaks and volumes, groundwater and the urban environment, and the June 1972 Rapid City flood disaster. (See W75-08787 thru W75-08824) (Humphreys-ISWS)
W75-08786

REHABILITATION OF A CHANNELIZED RIVER IN UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.

For primary bibliographic entry see Field 8A.
W75-08787

SWIMMING PERFORMANCE OF ARCTIC GRAYLING,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W75-08788

HYDRAULICS OF A GRAVEL CORE FISH SCREEN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8I.
W75-08790

MEASUREMENT OF INSTANTANEOUS BOUNDARY SHEAR STRESS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 8G.
W75-08791

WALL SHEAR STRESS MEASUREMENTS WITH HOT-FILM SENSORS,
Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
For primary bibliographic entry see Field 8G.
W75-08792

ANALYSIS OF FLOW IN CHANNELS WITH GRAVEL BEDS,
Washington State Univ., Pullman. Dept. of Civil Engineering.
J. A. Roberson, and S. J. Wright.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 63-72, 1973. 2 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Channel flow, *Roughness(Hydraulic), *Mathematical models, *Flow resistance, Channels, Beds, Gravels, Drag, Shear stress, Boundaries(Surfaces), Velocity, Model studies.

The problem of predicting the resistance of flow in channels with rough surfaces has faced practicing engineers for many years. The common solution to this problem has been to perform experimental tests which model the actual flow situation. A mathematical model previously used to predict the resistance to flow in conduits with a low concentration of roughness was modified to consider completely roughened boundaries. The resistance to flow in streams with a natural type of roughness can be adequately predicted. The larger roughness elements contribute a relatively greater proportion of resistance; therefore, when using this method for modeling other types of roughness, more attention should be directed to the characteristics of the largest elements. (See also W75-08786) (Sims-ISWS)
W75-08793

DISCHARGE, SLOPE, BED ELEMENT RELATIONS IN STREAMS,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 2E.
W75-08794

FLOOD PLAIN MANAGEMENT IN MONTANA,
Montana Dept. of Natural Resources and Conservation, Helena. Floodway Management Bureau.
For primary bibliographic entry see Field 6F.
W75-08795

ENVIRONMENTAL IMPACTS OF RESERVOIRS--A CASE STUDY,
Stanford Univ., Calif. Dept. of Civil Engineering.

For primary bibliographic entry see Field 6G.
W75-08796

FLOODLAND MANAGEMENT: THE ENVIRON-MENTAL CORRIDOR CONCEPT,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 6F.
W75-08797

PILOT STUDY IN FLOOD PLAIN MANAGEMENT,
Washington State Univ., Pullman. R. L. Albrook Hydraulic Lab.
For primary bibliographic entry see Field 6F.
W75-08798

FLOW FIELD SURROUNDING A SUCTION PIPE INLET,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
D. R. Basco, and W. J. Apgar.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 121-130, 1973. 6 fig, 7 ref, 2 append.

Descriptors: *Flow, *Pipes, *Dredging, Mathematical models, Hydraulic models, Hydraulic similitude, Intakes, Inflow, Flow profiles, Flow measurement, Hydraulics, Laboratory tests.
Identifiers: *Suction pipes.

In a hydraulic dredging system, approximately 15-20% of solids (by volume) is entrained in a turbulent suspension of water at the suction entrance pipe leading to the centrifugal dredge pump. The slurry is then usually pumped from the dredge via a pipeline to the disposal area. Very little is known about the basic mechanisms for material entrainment at the cutter intake. For many years dredgers showed little or no interest in this area. However, because dredging has recently been considered a source of pollution, (turbidity cloud reduces photosynthesis, creates local oxygen demand, etc.) they have become quite interested in ways to devise 'clean' dredging systems. Potential flow theory was employed to construct a mathematical model of the velocity field. Only the vertical pipe, axisymmetric case was initially considered. A physical model was also constructed. Measurement of low water velocities in the reservoir surrounding the pipe were made by tracer and photograph techniques. The method employed used specially mixed, neutrally buoyant oil particles as the tracer. It was concluded that: viscous and boundary effects create separation zones and large scale circulation patterns which considerably alter the streamline patterns; and velocity decreases very rapidly with radius from the suction inlet in the theoretical model. (See also W75-08786) (Sims-ISWS)
W75-08799

WAVE REFRACTION ANALYSIS: AID TO INTERPRETATION OF COASTAL HYDRAULICS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. M. Colonell, S. C. Farrell, and V. Goldsmith.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 131-140, 1973. 5 fig, 15 ref.

Descriptors: *Waves(Water), *Coasts, *Refraction(Water waves), *Coastal engineering, Celerity, Beach erosion, Ocean waves, Refractivity, Erosion, Deposition(Sediments), Shoals, Beaches, Hydraulics, Sediment transport, Analysis, Massachusetts, New England.
Identifiers: Wave refraction diagrams.

The relative ease of preparing wave refraction diagrams with digital computer and automatic plotting routines allows their convenient application to a wide variety of engineering and geologic problems of the coastline. Two examples of such applications to New England coastal problems were discussed. For these problems, the wave refraction diagrams corresponding to many possible wave conditions were the primary analytical tool, with computations of various wave parameters along the shore being used for more detailed estimates of coastal process activity. The limitations and benefits of such analyses were emphasized. Substantiation of conclusions drawn from theoretical wave refraction studies obtained through field observations. (See also W75-08786) (Sims-ISWS)
W75-08800

CAVITATION CHARACTERISTICS OF 18-INCH BUTTERFLY VALVE,
For primary bibliographic entry see Field 8C.
W75-08801

WAVE FORCES ON CYLINDERS NEAR A PLANE BOUNDARY,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
T. Yamamoto, J. H. Nath, and L. S. Slotta.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 155-165, 1973. 7 fig, 8 ref. NOAA Contract 2-35187.

Descriptors: *Waves(Water), *Loads(Forces), *Drag, *Boundaries(Surfaces), Pipelines, Laboratory tests, Hydraulic models, Hydraulics, Oceanography.
Identifiers: *Wave forces, *Cylinders, Lift forces, Horizontal forces, Acceleration, Underwater pipes.

Only rigid cylinders subjected to flow which is perpendicular to the central axis were considered. In addition, the cylinders were circular and horizontal at a varying distance from a horizontal plane boundary and at a relatively large distance from the free water surface. Experimentally, the cylinders were subjected to waves and the total horizontal and vertical forces were measured. Theoretically, the steady flow was considered as well as the unsteady flow characterized by surface waves. Acceleration and velocity dependent forces can be considered separately, and then superimposed for determining wave forces on horizontal cylinders with good results for engineering purposes, provided the proper coefficient values are used. The coefficients can be properly evaluated from potential flow theory if the drag forces and vortex forces are negligible with respect to the added mass effects and the circulation lift forces. Experimental results with waves agreed fairly well with the theory that the horizontal and vertical acceleration forces are equal for a cylinder close to a plane boundary. The convective acceleration should not be neglected in some cases when determining the horizontal force due to fluid acceleration. For one case investigated it was equal to 30% of the total acting horizontal acceleration force. Lift forces on horizontal cylinders from circulation can be accurately estimated for waves. (See also W75-08786) (Sims-ISWS)
W75-08802

DESIGN OF COOLING TOWER RETURN CHANNEL FOR TVA'S BROWNS FERRY NUCLEAR PLANT,
Tennessee Valley Authority, Norris. Engineering Lab.
For primary bibliographic entry see Field 5D.
W75-08803

TRANSIENT COOLING POND BEHAVIOR,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W75-08804

GENERAL CONSIDERATIONS OF FLOW IN BRANCHING CONDUITS,
Bureau of Reclamation, Denver, Colo.
T. J. Rhone.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 205-214, 1973. 3 fig, 7 ref, 1 append.

Descriptors: *Conduits, *Flow, *Pipe flow, *Flow characteristics, Fluid mechanics, Hydraulics, Head loss, Cavitation, Pipes, Hydraulic models, *Reviews.
Identifiers: *Branching conduits, Dividing flow, Combining flow, Wyes, Manifolds, Branch spacing, Flow disturbance.

A review of the literature shows that the configurations of branches and manifolds used to combine or divide flows are many and diverse. The terminology and definitions used in describing the structure and the flow phenomena are equally varied and the attempts of experimenters to generalize on design criteria show complex the problem is. One thesis that was repeated over and over was that the published information is adequate for preliminary designs but model investigations are essential to assure a satisfactorily operating structure. Well documented information on prototype operation is almost nonexistent and every attempt should be made to further the knowledge in this field. It was hoped that the work of the Task Committee on Branching Conduits of the ASCE will be of some aid in reducing the confusion in nomenclature and definition as well as providing some consistency in presenting the previously published experimental data. Recommended head loss coefficients curves developed from an analysis of this data should be of significant assistance to the practicing design engineer. (See also W75-08786) (Sims-ISWS)
W75-08805

COMBINING FLOW IN BRANCHES AND WYES,
Beck (R. W.) and Associates, Seattle, Wash.
J. V. Williamson.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York p 215-226, 1973. 7 fig, 11 ref, 2 append.

Descriptors: *Conduits, Flow, *Pipe flow, *Flow characteristics, Fluid mechanics, Hydraulics, Head loss, Pipes, Hydraulic models.
Identifiers: *Branching conduits, *Wyes, Combining flow, Conical junctions, Cylindrical junctions.

A progress report on the activities of the Task Committee on Branching Conduits was presented. It gave the results of investigations on the subject of head losses for combining flow with special reference to large hydraulic conduits. In general, circular conduits were analyzed. Results of experiments were plotted and compared on the same basis for the various conditions of branch junction geometry. Based on these comparisons, recommended values for head loss coefficients were developed and were included as illustrations. (See also W75-08786) (Sims-ISWS)
W75-08806

FLOW THROUGH TRIFURCATIONS AND MANIFOLDS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
E. Ruus.

In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 227-239, 1973. 4 fig, 11 ref, 2 append.

Descriptors: *Conduits, *Flow, *Pipe flow, Flow characteristics, Fluid mechanics, Head loss, Pipes, Hydraulics, Fluid friction, Friction.
Identifiers: *Branching conduits, *Trifurcations, *Manifolds, Combining flow, Dividing flow.

The total head losses in a piping system are generally considered to consist of losses due to pipe wall friction and those due to local changes in flow pattern. The local or form losses caused by the local flow pattern changes in trifurcations and manifolds were considered. The term form loss includes the head loss measured across the branching configuration (trifurcation or manifold) and the additional losses occurring over a distance up to 30 diameters in the branches downstream. These additional losses are caused by the junction and appear as an increase in regular losses due to branch wall friction. Many investigations were reviewed. The state of art presented and the conclusions drawn were based primarily on the results of those applicable for large diameter installations, at which the total form loss includes the additional losses in branches, but excludes losses due to wall friction. (See also W75-08786) (Sims-ISWS)
W75-08807

REGULATION OF LOW STREAMFLOWS,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 4A.
W75-08808

RESERVOIR OPERATION USING SNOW SURVEY DATA,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 4A.
W75-08809

PHYSICAL AND BIOLOGICAL REHABILITATION OF A STREAM,
Montana State Univ., Bozeman. Dept. of Fisheries.
For primary bibliographic entry see Field 4A.
W75-08810

DEVELOPMENT OF A WATER PLANNING MODEL FOR MONTANA,
Montana State Univ., Bozeman. Dept. of Industrial Engineering and Computer Science.
For primary bibliographic entry see Field 6A.
W75-08811

SEDIMENT TRANSPORT SYSTEM IN A GRAVEL-BOTTOMED STREAM,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 2J.
W75-08812

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-08813

WATER POLLUTION CONTROL BY HYDRAULIC AERATION,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W75-08814

CHARACTERISTICS OF AN AIR-WATER MIXTURE IN A VERTICAL SHAFT,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
C. S. Martin.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 323-334, 1973. 4 fig, 13 ref.

Descriptors: *Aeration, *Bubbles, *Flow, Pipes, Froude number, Laboratory tests, Hydraulics, Piezometers, Instrumentation, Hydraulic models, Pipe flow, Hydraulic structures, Sewers.
Identifiers: *Air-water mixtures, *Vertical shafts, Bubbly flow, Slug flow, Transport concentration.

In addition to the need for the understanding of flow in a vertical shaft spillway, recently built and futuristically planned engineering projects that entail the dropping of storm water down vertical shafts of great height necessitate the study of the flow processes in greater detail. Slug-flow conditions are of special concern because of the attendant problem of vibration as well as possible blowout or blowback of huge air pockets. A test apparatus included a 140 mm ID Plexiglass test pipe. This vertically mounted pipe was 8.01 m long and had a well-streamlined entrance at the top. Piezometers were mounted at frequent intervals along the pipe. Provisions were made to control the flow and to provide air to the water flow either by natural entrainment, or by forced aeration under pressure. Transition from bubbly flow to slug flow in a vertically downward air-water mixture was found to occur if the flowing volumetric concentration was greater than 0.235. The difference in entrance conditions between the cases of natural aeration and forced aeration had no apparent effect on transition. The slugs can be quite irregular in shape, possessing a tendency to ride the wall of the conduit. (See also W75-08786) (Sims-ISWS)
W75-08815

MODELING WIND INDUCED WATER CURRENTS,
Worcester Polytechnic Inst., Mass. Alden Research Labs.
For primary bibliographic entry see Field 5B.
W75-08816

OVERFLOW SPILLWAY ENERGY DISSIPATION BY JET ASSISTED HYDRAULIC JUMP,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
T.-Y. Kao, and D. L. Shoemaker.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 349-358, 1973. 4 fig, 5 ref, 1 append.

Descriptors: *Spillways, *Hydraulic jump, *Energy dissipation, Supercritical flow, Model studies, Hydraulic models, Jets, Structures, Hydraulic structures, Dams, Discharge(Water), Hydraulics.

High overflow spillways produce a water jet at the toe which contains a tremendous amount of kinetic energy due to the high velocity supercritical flow. Unless the energy contained in this flow is effectively dissipated before the flow enters the natural stream bed, severe erosion and, possibly, undermining of the structure will result. The most common energy dissipation methods are those which employ the hydraulic jump. To help stabilize the jump, various devices which create internal friction and turbulence are usually used. A new approach to control of the hydraulic jump is by using a submerged cross jet. The principles involved in the application of a submerged water jet to control

the hydraulic jump are similar to those of chute blocks, end sills, and baffle piers. The water jet acts as a chute block to divert the high velocity bottom flow upward. In this study, a three foot high overflow spillway was used as the control structure which provides the supercritical flow and maintains the operating head for the siphon jet. The results indicated that, for this particular model, at higher Froude number range the siphon-jet system requires smaller tailwater depth compared to that required by all other types of hydraulic jump control arrangement. On the other hand, at the lower Froude number region, the cross jet does not appear to be as effective as the solid control appurtenances. The comparison of the energy dissipation characteristics of the jet system to stilling basins revealed approximately the same general trend. For the most part, the jet controlled jump has higher efficiency than that provided by the Bureau of Reclamation type II stilling basin. (See also W75-08786) (Sims-ISWS)
W75-08817

WINTER STORM AND FLOOD ANALYSES, NORTHWEST INTERIOR,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W75-08818

CALIBRATION OF WATERSHED WETNESS AND PREDICTION OF FLOOD VOLUME FROM SMALL WATERSHEDS IN HUMID REGION,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 2A.
W75-08819

PREDICTING LOW FLOWS AND FLOODS FROM UNGAGED DRAINAGE BASINS,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08820

ESTIMATION FLOODS SMALL DRAINAGE AREAS IN MONTANA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4A.
W75-08821

ARTIFICIAL RECHARGE IN THE URBAN ENVIRONMENT--SOME QUESTIONS AND ANSWERS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 4B.
W75-08822

POLLUTION POTENTIAL OF A SANITARY LANDFILL NEAR TUCSON,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5B.
W75-08823

METEOROLOGY AND HYDROLOGY OF RAPID CITY FLOOD,
Corps of Engineers, Omaha, Nebr. Hydrology and Meteorology Section.
For primary bibliographic entry see Field 2E.
W75-08824

EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08847

8C. Hydraulic Machinery

STEAM, HOT-WATER AND ELECTRICAL THERMAL DRILLS FOR TEMPERATE GLACIERS,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W75-08409

SALVAGE OF HEAVY CONSTRUCTION EQUIPMENT BY A FLOATING ICE BRIDGE,
Foundation of Canada Engineering Corp. Ltd., Calgary (Alberta). Arctic Div.
For primary bibliographic entry see Field 8G.
W75-08461

MECHANICAL HARVESTING OF AQUATIC VEGETATION: DEVELOPMENT OF A HIGH SPEED PICKUP UNIT,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4A.
W75-08471

AUTOMATION OF FILTERS IN PURIFYING DEVICES IN WATER PIPES (AVTOMATIZATSIYA FIL'TROV NA VODOPROVODNYKH OCHISTNYKH SOORUZHENIYAKH),
For primary bibliographic entry see Field 5F.
W75-08572

NEW DIAPHRAGM PUMP UTILIZES OLD PRINCIPLE.
Chemical Processing, Vol 20, No 9, p 44, September, 1974. 1 fig.

Descriptors: *Pumps, *Venturi, Pressure, Valves, Liquids, Operation, Equipment, Liquids, Corrosion.
Identifiers: *Diaphragm pumps.

A new air pressure, diaphragm-operated pump has been designed to handle a wide range of liquids. Its operating principle is the adaptation of the venturi effect to create low pressure and actuate the suction cycle; it may be driven by compressed air, either from mains supply or from a portable compressor. The pump operation is the same as conventional diaphragm pumps but its new feature centers around the control of the cycle of pressurization and evacuation. Air supply and exhaust are controlled by a poppet valve, moved between two end positions by a control rod attached to the diaphragm membrane. The diaphragm is flexible and the pressure of the liquid in the pumping compartment is the same as that in the air compartment throughout the operation of the pump. The applications of this pump range from handling viscous liquids to dealing with various corrosive fluids. (Prague-FIRL)
W75-08673

PUMPS FOR POLLUTION CONTROL,
For primary bibliographic entry see Field 5D.
W75-08674

METHOD FOR CONSTRUCTING ICE ISLANDS IN COLD REGIONS,
Union Oil Co. of California, Los Angeles. (assignee)
P. J. Durning.
U.S. Patent No. 3,863,456, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 73, February 4, 1974.

Descriptors: *Patents, *Cold regions, Offshore platforms, Drilling, Ice.
Identifiers: Artificial islands, *Ice islands.

This invention relates to the construction of ice islands, and more particularly to a method for forming artificial ice island in cold regions to serve as a base for operations. Construction of the ice island is commenced by depositing water directly onto the surface of the ice sheet at the desired location. Sea water can be used to form the ice island, however, fresh water is preferred, if available, since fresh water forms higher strength ice upon freezing. Water is placed upon the ice sheet either by flooding or by spraying. The water is discharged onto the surface of the natural ice at the center of the portion to be thickened in an oval or circular pattern having its thickest portion at the middle and tapering outwardly to the edges. The application of water is continued until the mass of the ice body is such that its draft is greater than the depth of the water body so that the ice body becomes grounded and anchored in place. Flooding is continued until the mass of ice island is sufficient to securely anchor the island to the marine bottom and to obtain an elevated working platform. (Sinha-OEIS)
W75-08734

MARINE WATER INLET DEVICE MEANS,
P. M. Banner.
U.S. Patent No. 3,864,260, 4 p, 11 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 331, February 4, 1975.

Descriptors: *Patents, *Boats, *Water supply, Pipes, Pipe flow.
Identifiers: Inlet pipes, *Pipe cleaning devices.

A water inlet cleaning device for marine craft and fluid supply systems is disclosed that will clean out the inlet pipe and inlet fitting from foreign matter allowing liquid to flow. The device can operate manually or automatically, having a signal responsive means to indicate a clogging condition and the subsequent operation of the device. (Sinha-OEIS)
W75-08743

DIFFUSED AERATION PIPE APPARATUS FOR USE WITH AN AERATION TANK,
Nigata Engineering Co. Ltd., Tokyo (Japan). (assignee)
For primary bibliographic entry see Field 5D.
W75-08745

APPARATUS FOR SUBSOIL IRRIGATION,
For primary bibliographic entry see Field 3F.
W75-08748

CONTROL APPARATUS FOR A WATER SUPPLY SYSTEM,
Weil-McLain Co., Inc., Dallas, Tex. (assignee)
E. M. Deters.
U.S. Patent No. 3,865,512, 7 p, 10 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 756, February 11, 1975.

Descriptors: *Patents, *Water supply, Pressure, Pumps, Equipment, *Control systems.

A control apparatus for a water supply system has a motor operated pump for pumping water through a delivery line to one or more valved outlets. The control apparatus includes a pressure switch responsive to the pressure in the delivery line and operable at preselected upper and lower pressure limits to respectively stop and start the pump motor. It also includes a control valve for controlling flow from the pump to the delivery line operable during normal flow from the delivery line to maintain the delivery line pressure in a regulated pressure range below the upper switch operating pressure and operable when flow from the delivery line is terminated to cause the pressure in the delivery line to rapidly build up to the upper switch operating pressure. The control valve also has provision for shutting off flow to the delivery line when the pressure rises above the

upper switch operating pressure, to prevent further increase in pressure in the delivery line. (Sinha-OEIS)
W75-08749

PURIFICATION CONTROL UNIT,
Camper and Nicholsons Ltd., Gosport (England). (Assignee).
For primary bibliographic entry see Field 5F.
W75-08751

CAVITATION CHARACTERISTICS OF 18-INCH BUTTERFLY VALVE,
S. M. Cho, W. J. Carlson, and M. J. Tessier.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 141-154, 1973. 10 fig, 1 tab, 9 ref, 2 append. AEC Contract AT(04-3)-700.

Descriptors: *Valves, *Cavitation, *Hydraulics, Fluid mechanics, Butterfly valves, Hydraulic valves, Flow, Equipment, Systems analysis, Laboratory tests, Head loss, Hydraulic equipment, Damage, Erosion.
Identifiers: *Incipient cavitation index.

Test data were presented for the head-loss coefficients and the incipient cavitation indexes as a function of the valve disk position for an 18-inch butterfly valve in water. The test results for the incipient cavitation index, when compared to other experimental data, showed reasonable agreement at lower valve openings, but increasing discrepancy with an increasing valve opening. It appeared that the discrepancy is due mainly to the differences in the size of the valve, the system pressure, and the quality of the test water. The effects of different fluids, of room temperature test water versus high temperature liquid sodium, on the incipient cavitation index and cavitation damage were discussed. For the incipient cavitation index, the information obtained in the water system may be extended to the sodium system conservatively. However, as for cavitation damage, unilateral conservatism cannot be stated. The cavitation information obtained in the water system was applied to a sodium flow loop in which a number of butterfly valves are to be installed. A method of optimizing the valve disk positions to minimize cavitation potential in the loop was discussed. (See also W75-08786) (Sims-ISWS)
W75-08801

DESIGN OF COOLING TOWER RETURN CHANNEL FOR TVA'S BROWNS FERRY NUCLEAR PLANT,
Tennessee Valley Authority, Norris. Engineering Lab.
For primary bibliographic entry see Field 5D.
W75-08803

TRANSIENT COOLING POND BEHAVIOR,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5D.
W75-08804

METER FOR SEWER FLOW MEASUREMENT,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W75-08850

8D. Soil Mechanics

SEEPAGE CHARACTERISTICS OF FOUNDATIONS WITH A DOWNSTREAM CRACK,
Madras Univ., Guindy (India). Coll. of Engineering.
R. Sakthivadivel, and S. Thiruvengadachari.

Journal of Hydraulic Research, Vol 13, No 1, p 57-77, 1975. 5 fig, 5 tab, 5 ref.

Descriptors: *Seepage, *Foundations, *Uplift pressure, *Mathematical studies, *Cracks, Underseepage, Flow nets, Hydraulic structures, Dams, Equations, Flow around objects, Flow, Distribution patterns, Model studies, Pipe flow.
Identifiers: *Conformal transformations, *Electrolytic tank models.

The seepage characteristics of foundations with a downstream crack were analyzed with the use of a conformal transformation technique. Two cases were investigated: a downstream vertical crack in a finite depth of pervious stratum and a downstream inclined crack of finite depth in a pervious stratum of infinite depth. Experimental verification of the flow lines with an electrolytic tank model showed satisfactory agreement with the theory. It was shown that a downstream foundation crack, irrespective of its length and inclination, has negligible effect on the seepage characteristics when the crack is at a distance equal to or greater than the depth of the previous stratum from the downstream end of the hydraulic structure. (Prickett-ISWS)
W75-08432

SEEPAGE THROUGH OPENING IN CUTOFF WALL UNDER WEIR,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
S. P. Brahma.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol 101, No GT3, Proceedings Paper 11204, p 329-340, March 1975. 4 fig, 7 ref, 2 append.

Descriptors: *Cutoff walls, *Graphical analysis, *Seepage, *Uplift pressure, Weirs, Soil mechanics, Walls, Hydraulics, Cutoffs, Porous media, Groundwater.
Identifiers: *Conformal mapping.

A solution to the problem of seepage through an opening in a cutoff wall under an impervious structure lying on the ground level was presented with the use of the conformal transformation technique. The cutoff extends from the base of the structure to the impervious layer, which is overlaid by an isotropic and homogeneous porous stratum. The solution was found to agree with established solutions for a partial cutoff wall and for a partial cutoff wall under a weir sitting on the ground level. Graphical presentation of the solution, which takes into account the geometry, was made for ready use by designers. (Lee-ISWS)
W75-08711

8E. Rock Mechanics and Geology

GEOLOGY OF GEOTHERMAL TEST HOLE GT-2, FENTON HILL SITE, JULY 1974,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5A.
W75-08649

PROJECT DIAMOND ORE, PHASE IIA: CLOSE-IN MEASUREMENTS PROGRAM,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5A.
W75-08659

8G. Materials

SEEPAGE CHARACTERISTICS OF FOUNDATIONS WITH A DOWNSTREAM CRACK,
Madras Univ., Guindy (India). Coll. of Engineering.
For primary bibliographic entry see Field 8D.

W75-08432

SALVAGE OF HEAVY CONSTRUCTION EQUIPMENT BY A FLOATING ICE BRIDGE,
Foundation of Canada Engineering Corp. Ltd., Calgary (Alberta). Arctic Div.
H. R. Kivisild, G. D. Rose, and D. M. Masterson.
Canadian Geotechnical Journal, Vol 12, No 1, p 58-69, February 1975. 12 fig, 2 tab, 7 ref, 1 append.

Descriptors: *Ice, *Cold weather construction, *Bridge construction, Civil engineering, Construction materials, Construction equipment, Engineering structures, Freezing, Bearing strength, Strength of materials, Tides, Salinity, Temperature, On-site data collections, *Canada.
Identifiers: *Floating ice bridges, *James Bay.

During the summer of 1972, a barge load of heavy construction equipment under tow to the James Bay Project on the eastern shore of James Bay became grounded on a shoal at the mouth of the Fort George River, only a few miles from its intended destination. Federal Commerce and Navigation Limited retained Foundation of Canada Engineering Corporation Limited (FENCO) to study the feasibility of removing the heavy equipment from the barge by an overice crossing. FENCO personnel visited the site in November and December 1972, compiled the necessary environmental data, and designated a crossing consisting of ice built up by flooding. Following the completion of the 100 foot wide and 74 inch thick bridge by Sainte-Marie Construction, the ice bridge was instrumented and tested prior to and during the unloading process. Parameters measured were thickness, width, temperature, ice soundness, and deflections. Tide readings were also taken. Loads of 70 tons and heavy trucks were removed with no problem. Deflections were very small and cracking was confined to the tidal zone. (Sims-ISWS)
W75-08461

REDUCING FLUID FRICTION WITH OKRA,
Clemson Univ., S.C.
W. E. Castro, and J. G. Neuwirth, Jr.
Chemtech, p 697-701, November 1971. 10 fig, 15 ref. OWRR A-009-SC(4).

Descriptors: *Fluid friction, Polymers, Flow resistance, Turbulent flow, Pipe flow.
Identifiers: Okra gum, Polysaccharides, Bovine blood.

The use of high polymer additives to reduce flow friction in turbulent pipe flow has been well documented. For engineering applications, polymers which are more resistant to shear degradation are needed. Okra gum, a natural occurring polysaccharide, was investigated as a potential friction reducing additive. Pheological studies in the literature indicate that this material is suitable for this purpose. Okra gum in saline has also been used successfully as a plasma expander suggesting its use in blood flow. Experimental results show that Okra gum, in dilute aqueous solution is a very effective friction reducer in turbulent pipe flow with overall behavior comparable to polyethylene oxide. Preliminary experiments on friction reduction of bovine blood with Okra gum show the same general behavior as obtained in aqueous solutions and suggest other applications of this phenomenon.
W75-08605

MEASUREMENT OF INSTANTANEOUS BOUNDARY SHEAR STRESS,
Agricultural Research Service, Fort Collins, Colo.
P. H. Blinco, and D. B. Simons.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 43-54, 1973. 5 fig, 18 ref, 1 append.

Descriptors: *Shear stress, *Streamflow, *Sediment transport, Flow, Flumes, Beds, Channels, Erosion, Channel erosion, Scour, Anemometers, Turbulent flow, Turbulent boundary layers, Laboratory tests.
Identifiers: Hot-film anemometers.

Measurement of the instantaneous boundary shear stress was made for several flow conditions in a smooth open channel. Comparison with related previous work suggested that the flush surface hot-film sensor is capable of measuring the turbulent boundary shear stress in hydraulically smooth flows. Statistical inference from time series analysis revealed the following information: (1) The relative turbulence intensity of the shear stress decreased with increasing Reynolds number. (2) The probability density function of the shear stress is positively skewed. (3) The spectral density function of the boundary shear stress process indicated that most of the energy was found to be associated with frequencies less than 3 hertz. (See also W75-08786) (Sims-ISWS)
W75-08791

WALL SHEAR STRESS MEASUREMENTS WITH HOT-FILM SENSORS,
Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
O. Yucel, and W. H. Graf.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York p 55-61, 1973. 8 ref.

Descriptors: *Shear stress, *Instrumentation, *Sediment transport, Laboratory tests, Anemometers, Pipe flow, Sands, Heat transfer, Hydraulics.
Identifiers: *Hot-film shear sensors, Wall shear stress.

Experiments conducted in both clear-water and sand-water mixture flow experiments indicated that the flush-mounting hot-film shear sensors can be used for the measurement of the wall shear stress. However, a modification of the clear-water calibration equation is necessary for each sensor to account for the increased heat transfer due to suspended sand particles. (See also W75-08786) (Sims-ISWS)
W75-08792

8H. Rapid Excavation

A REVIEW OF EXPLOSIVES USED IN EXPLOSIVE EXCAVATION RESEARCH LABORATORY PROJECTS SINCE 1969,
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
H. H. Reed.
Available from the National Technical Information Service, Springfield, Va 22161. Miscellaneous Paper-E-74-6, December 1974. 54 p, 1 fig, 3 tab, 17 ref, 1 bib, 1 append.

Descriptors: *Beneficial use, *Nuclear explosions, *Exploration, *Excavation, Safety, Evaluation, Surveys, Design criteria, Construction, Constraints, Research and development, Materials, Specifications, *Reviews.

Since 1969 the Explosive Excavation Research Laboratory has been engaged primarily in using commercially developed explosives and blasting agents in a variety of explosives excavation jobs and experiments. Dry and wet (slurry) explosives and blasting agents have comprised the bulk of these products, which are generally fuel-oxidizer mixes with an ammonium nitrate base. General properties of these explosives are covered. The specific products used by EERL are discussed in detail as are the media in which they were used. Techniques available for procuring explosives are also discussed. (Houser-ORNL)

W75-08650

8I. Fisheries Engineering

BEHAVIORAL RESPONSES OF NORTHERN PIKE, YELLOW PERCH AND BLUEGILL TO OXYGEN CONCENTRATIONS UNDER SIMULATED WINTERKELL CONDITIONS,
Ichthyological Associates, Inc., Middletown, Del.
For primary bibliographic entry see Field 5C.
W75-08361

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: FISHERIES,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 6B.
W75-08580

METHOD FOR PROVIDING COOLED AERATED WATER,
L. E. Gallup.
U.S. Patent No. 3,863,605, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 931, No 1, p 124, February 4, 1975.

Descriptors: *Patents, *Aquiculture, *Aeration, *Fish management, *Water temperature, Fish, Trout, Oxygen, Temperature control.
Identifiers: *Aquaculture, Heat exchange.

The invention is directed to a trout growing system which enables the maintenance of water conditions suitable for the growth of trout year round in climates normally incapable of providing adequately low water temperatures in combination with sufficiently high levels of oxygen in the water in which the trout are maintained. The method comprises the steps of taking quantities of oxygen-rich warm water from near the surface of the body of water and moving it into a heat exchange relationship with the cooler oxygen-poor water without intermixing the oxygen-rich warm water with the oxygen-poor cooler water. A conduit extends through the deeper portion of a body of water. The oxygen-rich warm water enters the conduit through an inlet and flows along the length of the conduit and is discharged into a separate storage area. (Sinha-OEIS)
W75-08733

SWIMMING PERFORMANCE OF ARCTIC GRAYLING,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W75-08788

HYDRAULICS OF A GRAVEL CORE FISH SCREEN,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. E. Nece, and M. C. Bell.
In: Hydraulic Engineering and the Environment; Proceedings of the 21st Annual Hydraulic Division Specialty Conference, Montana State University, Bozeman, August 15-17, 1973. American Society of Civil Engineers, New York, p 31-41, 1973. 6 fig, 3 tab, 6 ref.

Descriptors: *Gravels, *Head loss, *Fish barriers, Screens, Breakwaters, Hydraulic structures, Trout, Salmon, Fish behavior, Intakes, Structures.

Screens are needed to prevent fish or other aquatic life from entering diversions located on lakes, rivers, or estuaries. A possible alternative to the more conventional screens was considered. The concept is that of a gravel core screen placed within a rubble mound breakwater enclosing the intake structures. The proposed idea involved questions for which limited data were readily available. Consequently, a two-phase study was

initiated to: (1) determine head losses associated with flow through gravel core screens, and (2) determine the behavior of small fish with respect to penetrating gravel screens. The tests gave lower friction factors than are obtained from flows through rubble. Fanning friction factors f between 3.0 and 10 can be used as suitable limits in design calculations. A limited number of fish penetration tests were run in a laboratory flume. Some correlation between a calculated minimum opening size and fish size was indicated by these limited data. Results were too restricted to draw numerical conclusions. (See also W75-08786) (Sims-ISWS)
W75-08790

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

UNIVERSITY OF NEBRASKA FACULTY WITH COMPETENCE IN WATER RESOURCES - SECOND EDITION.
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 10D.
W75-08472

DIRECTORY OF KENTUCKY WATER RESEARCH PERSONNEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 10D.
W75-08485

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

WATER RESOURCES: A BIBLIOGRAPHIC GUIDE TO REFERENCE SOURCES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 10C.
W75-08486

10C. Secondary Publication And Distribution

WATER RESOURCES: A BIBLIOGRAPHIC GUIDE TO REFERENCE SOURCES,
Connecticut Univ., Storrs. Inst. of Water Resources.
V. H. Ralston.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 310, $5.25 in paper copy, $2.25 in microfiche. Institute Report No 23, (University of Connecticut Library Storrs Bibliography Series, No 2), January 1975. 123 p. OWRT A-999-CONN(16).

Descriptors: *Information retrieval, Water resources, *Libraries, *Bibliographies, *Publications, *Abstracts, Information exchange, Indexing, Documentation.
Identifiers: *Bibliographic guide, *Reference sources, Statistics sources, Encyclopedias, Information services.

A detailed study has been made of water resources literature materials; and an inventory of reference sources available and a guide facilitating their location and use have been compiled. Initially undertaken as an attempt to classify the publications of the various water resources research institutes and organizations, emphasis was placed, as the research progressed, on providing a guide to reference materials, and in this way outlining the literature of the field, rather than producing a sub-

ject approach to individual items in the University of Connecticut collection. Sections on water resource-related Guides to the literaute, Dictionaries, Encyclopedias, Statistics sources, Standards, Bibliographies and Information services are included. In addition to reference titles, pertinent material such as editors or authors' names, publishers and addresses, dates of publication and availability are mentioned. Of the 411 references to individual publications of services, 46% are sponsored by government agencies, emphasizing the importance of both federal and state governments in the support of research and the resulting literature. (deLara-Connecticut)
W75-08486

ENVIRONMENT: A BIBLIOGRAPHY ON SOCIAL POLICY AND HUMANISTIC VALUES,
Nevada Univ., Reno. Desert Research Inst.
R. T. Roelofs, and W. Jenkins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 303, $5.75 in paper copy, $2.25 in microfiche. Center for Water Resources Research, Project Report No 31, May 1975, 136 p. OWRT A-039-NEV(1). 14-31-0001-3228.

Descriptors: *Environment, *Bibliographies, Social aspects, *Social values, Evaluation, Indexing, *Environmental effects, Water quality, Water policy.

This comprehensive bibliography contains over 3,000 items covering publishing material on and related to the environment as it pertains to social policy and humanistic values. Material was selected if it was substantively, methodologically or theoretically relevant to man and his activities in relation to the environment. This bibliography is compiled alphabetically by author with a cross-referenced category index of fifty-six subjects. (Fallon-Nevada)
W75-08489

RESEARCH AND ADVANCES IN GROUND-WATER RESOURCES STUDIES, 1964-1974,
Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 2F.
W75-08825

INDEX TO MAPS TO FLOOD-PRONE AREAS IN INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 7C.
W75-08834

10D. Specialized Information Center Services

UNIVERSITY OF NEBRASKA FACULTY WITH COMPETENCE IN WATER RESOURCES - SECOND EDITION.
Nebraska Univ., Lincoln. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 381, $4.75 in paper copy, $2.25 in microfiche. Publication No 6, February 1975, 70 p. OWRT A-999-NEB(15). 14-31-0001-5027.

Descriptors: *Specialization, *Nebraska, Water resources institute, *Personnel, *Scientific personnel, Research and development.

Information was prepared to provide a basis for identifying individuals with special competence and expertise for research and/or teaching in the water resources field at the University of Nebraska. It is espected that this listing will be useful in the future development of both individual and interdisciplinary research project activities.
W75-08472

DIRECTORY OF KENTUCKY WATER
RESEARCH PERSONNEL,
Kentucky Water Resources Inst., Lexington.
R. R. Huffsey.
Available from the National Technical Informa-
tion Service, Springfield, Va 22161 as PB-242 309,
$4.25 in paper copy, $2.25 in microfiche. Technical
Series No 100, March 1975. 46 p. OWRT A-999-
KY(2). 14-31-0001-5017.

Descriptors: *Personnel, Manpower, *Scientific
personnel, Human resources, *Kentucky, Or-
ganizations, Water resources Institute,
*Specialization.
Identifiers: *Directories, Water research person-
nel.

The Directory is a tabulation of Interest Profiles
that were distributed throughout the Common-
wealth of Kentucky. The Directory section con-
sists of an alphabetic list of water and water-re-
lated keywords. Below the keyword is a list of in-
dividuals who have indicated a degree of expertise
in specific water-related areas in the Interest
Profile. The Directory also includes a list of the
Kentucky Water Resources Research Institute's
State Advisory Council. The primary function of
this group is to identify significant water research
needs throughout the Commonwealth. The
University Advisory Council, which aids the In-
stitute in generating and evaluating water research
proposals, is also included. Addresses of the In-
stitute officers are also provided.
W75-08485

10F. Preparation Of Reviews

FORMATION OF HALOGENATED ORGANICS
BY CHLORINATION OF WATER SUPPLIES,
Harvard Univ., Cambridge, Mass. Dept. of Sanita-
ry Engineering.
For primary bibliographic entry see Field 05F.
W75-08357

A REVIEW OF THE LITERATURE ON THE
USE OF 2,4-D IN FISHERIES,
Southeastern Fish Control Lab., Warm Springs,
Ga.
For primary bibliographic entry see Field 05C.
W75-08587

A REVIEW OF THE LITERATURE ON THE
USE OF TFM-BAYLUSCIDE IN FISHERIES,
National Marine Fisheries Service, Ann Arbor,
Mich. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 05C.
W75-08588

CAVITATION DAMAGE SCALE EFFECTS--
STATE OF ART SUMMARIZATION.
International Association for Hydraulic Research,
Delft (Netherlands). Section for Hydraulic
Machinery, Equipment and Cavitation.
For primary bibliographic entry see Field 08B.
W75-08698

ALASKA

Observations of Stage, Discharge, pH, and Electrical Conductivity During Periods of Ice Formation in a Small Subarctic Stream,
W75-08440   2C

Swimming Performance of Arctic Grayling,
W75-08788   8A

ALBEDO

Some Characteristics of the Albedo of Snow,
W75-08452   2C

ALGAE

Modelling Primary Productin in Water Bodies: A Numerical Approach that Allows Vertical Inhomogeneities,
W75-08379   5C

Ecology of the Green Kryophilic Algae from Belanske Tatry Mountains (Czechoslovakia),
W75-08393   5C

Algae Removal by Upflow Filtration,
W75-08474   5D

Evaluation of Bacterial Production in a Pond in Sologne, (In French),
W75-08534   5C

Responses of the Three Test Algae of the Algal Assay Procedure: Bottle Test,
W75-08710   5A

ALGAE REMOVAL

Algae Removal by Upflow Filtration,
W75-08474   5D

ALLUVIAL CHANNELS

Channel Aggradation in Western United States as Indicated by Observations at Vigil Network Sites,
W75-08830   2J

ALTERNATIVE PLANNING

The Impact of Water Quality Objectives on Urban Water Supply Planning,
W75-08845   5D

AMERICIUM

Studies of Plutonium, Americium, and Uranium in Environmental Matrices,
W75-08646   5B

AMINES

The Photosensitizing Action of 2-Naphthylamine on Escherichia Coli, K-12,
W75-08476   5A

Amine Treatment Process for the Decolorization of Pulp Mill Effluents. Part I. Laboratory Studies,
W75-08559   5D

AMINO ACIDS

Dynamics of Free Amino Acid Content in Leaves of Winter Wheat Under Variable Conditions of Soil Moisture, (In Russian),
W75-08828   3F

AMMONIA PROBE

Determination of Nitrate in Water with an Ammonia Probe,
W75-08561   5A

AMMONIUM COMPOUNDS

A Highly Sensitive Automated Technique for the Determination of Ammonium Nitrogen,
W75-08382   5A

AMMONIUM NITROGEN

A Highly Sensitive Automated Technique for the Determination of Ammonium Nitrogen,
W75-08382   5A

ANALYSES

Microbiological Study of the Influence of Chalk on Pond Mud, (In French),
W75-08522   5B

ANALYSIS

Deducing Thickness Changes of an Ice Sheet From Radio-Echo and Other Measurements,
W75-08420   2C

Effect of Individual Factors on the Formation of Water Quality of the Kara Kum Canal as a Water Supply Source of the Turkmen SSR, (In Russian),
W75-08644   5B

The Configuration of the Hydrochemical Relationships in the Hungarian Section of the Danube During the Year 1971: Danubialia Hungarica LXVI, (In German),
W75-08680   5B

ANALYTICAL TECHNIQUES

Efficient Sequential Optimization in Water Resources,
W75-08404   4A

Properties of the Three-Parameter Log Normal Probability Distribution,
W75-08438   2E

An Examination of the Concentration of Organic Components Water-Extracted From Petroleum Products,
W75-08454   5A

Concentration of Adenovirus from Seawater,
W75-08455   5A

A Simple Respirometer for Measuring Oxygen and Nitrate Consumption in Bacterial Cultures,
W75-08458   5A

Non-Flame Atomization in Atomic Absorption Spectrometry,
W75-08529   5A

Standardization of Methods for the Determination of Traces of Mercury -- Part I. Determination of Total Inorganic Mercury in Inorganic Samples.
W75-08530   5A

Evaluation of Bacterial Production in a Pond in Sologne, (In French),
W75-08534   5C

Determination of Nanogram Quantities of Mercury in Sea Water,
W75-08535   5A

Spectrophotometric Determination of Tungsten in Rocks by an Isotope Dilution Procedure,
W75-08536   2K

Soil Moisture Movement Under Temperature Gradients,
W75-08597   2G

The Occurrence of Benthos Deep in the Substratum of a Stream,
W75-08602   5A

Quantitative Determination of Freon 12 and Freon 22 in Water, (In Russian),
W75-08682   5A

Responses of the Three Test Algae of the Algal Assay Procedure: Bottle Test,
W75-08710   5A

ANISOTROPY

A Study by the Finite-Element Method of the Influence of Fractures in Confined Aquifers,
W75-08443   2F

ANTARCTIC

Liquid Brine in Ice Shelves,
W75-08407   2C

Effect of Inversion Winds on Topographic Detail and Mass Balance on Inland Ice Sheets,
W75-08413   2C

Investigation of Polar Snow Using Seismic Velocity Gradients,
W75-08418   2C

ANTITRANSPIRANTS

Persistence of Selected Antitranspirants,
W75-08439   2D

APPROXIMATION METHOD

Physical Criteria in Computer Methods for Partial Differential Equations,
W75-08593   5G

APPROXIMATION TECHNIQUES

Evaluation of Bacterial Production in a Pond in Sologne, (In French),
W75-08534   5C

AQUACULTURE

Method for Providing Cooled Aerated Water,
W75-08733   8I

AQUATIC ALGAE

The Contribution of Agriculture to Eutrophication of Swiss Waters: I. Results of Direct Measurements in the Drainage Area of Various Main Drainage Channels,
W75-08376   5B

AQUATIC FUNGI

The Fungal Spora of a Freshwater Stream and its Colonization Pattern on Wood,
W75-08374   2E

AQUATIC INSECTS

Seasonal Variation of Sieving Efficiency in Lotic Habitat,
W75-08609   5A

AQUATIC LIFE

Flow-Through Apparatus for Acute Toxicity Bioassays with Aquatic Invertebrates,
W75-08563   5A

AQUATIC MICROORGANISMS

Concentration of Adenovirus from Seawater,
W75-08455   5A

AQUATIC PLANTS

Classification and World Distribution of Vegetation Relative to V/Stol Aircraft Operations,
W75-08366   7B

A New Doratomyces from Waterhyacinth,
W75-08606   4A

Occurrence of Cerocospora piaropi on Water Hyacinth in Florida,
W75-08610   4A

AQUATIC WEED CONTROL

Mechanical Harvesting of Aquatic Vegetation: Development of a High Speed Pickup Unit,
W75-08471   4A

Processing and Storage of Waterhyacinth Silage,
W75-08595   4A

DENSITY
A Model for Estimating Desired Levels of Nitrate-N Concentration in Cotton Petioles,
W75-08396   3F

Internal Wave Reflection by a Velocity Shear and Density Anomaly,
W75-08690   2E

DENSITY STRATIFICATION
A Two Layer Flow Through a Contraction,
W75-08701   8B

DENVER (COLO)
Potential Flood Hazard--North Avenue Area, Denver Federal Center, Lakewood, Colorado,
W75-08496   4A

Determination of Urban Watershed Response Time,
W75-08685   4C

DEPTH
Channelization: A Search for a Better Way,
W75-08714   8B

DESALINATION
Reverse Osmosis Makes High Quality Water Now,
W75-08564   3A

Research on Reverse Osmosis Membranes for Purification of Wash Water at Sterilization Temperature (165F), Report No 2,
W75-08575   3A

Method of Distilling Sea Water on Small Ships and Marine Platforms Having Internal Combustion Engine,
W75-08737   3A

DESALINATION APPARATUS
Sea Water Desalting Apparatus,
W75-08747   3A

Apparatus for Evaporating Liquids,
W75-08762   3A

Distillation Apparatus,
W75-08763   3A

DESALINATION PROCESSES
Method of Desalinating Salt Water,
W75-08631   3A

DESERTS
Classification and World Distribution of Vegetation Relative to V/Stol Aircraft Operations,
W75-08366   7B

DESIGN
Applications of Hydrology to Water Resources Management (Planning and Design Level),
W75-08400   6B

Apparatus and Procedure for Measuring Sublethal Toxicity of Wastewater Discharges,
W75-08586   5A

Self-Cleaning Storm Overflow Basins with Meander Duct (selbstreinigende regenuberlaufbecken mit Schlangenrinne),
W75-08679   5D

Sample Uncertainty in Flood Levee Design: Bayesian Versus Non-Bayesian Methods,
W75-08724   8A

MADAM I--A Numeric Method for Design of Adsorption Systems,
W75-08726   5D

The Civil Engineer and Field Drainage,
W75-08731   4A

DESIGN CRITERIA
Analysis and Design of Settling Basins for Irrigation Return Flow,
W75-08484   5G

Pumps for Pollution Control,
W75-08674   5D

Swimming Performance of Arctic Grayling,
W75-08788   8A

DESIGN DATA
Numerical Analysis of Warm, Turbulent Sinking Jets Discharged into Quiescent Water of Low Temperature,
W75-08684   5B

DESMIDS
Stereo-Scanning Electron Microscopy of Desmids,
W75-08383   5A

DEWATERING
Application of Acid/Pressure Flotation to the Thickening of Excess Activated Sludge (Zastosowanie flotacji kwasnocisnieniowej do zageszczania nadmiernego osadu czynnego),
W75-08544   5D

DIAGENESIS
Redox Processes in Diagenesis of Sediments in the Northwest Pacific Ocean,
W75-08463   2K

DIAPHRAGM PUMPS
New Diaphragm Pump Utilizes Old Principle.
W75-08673   8C

DIPTERA
Seasonal Variation of Sieving Efficiency in Lotic Habitat,
W75-08609   5A

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Directory of Kentucky Water Research Personnel,
W75-08485   10D

DISCHARGE MEASUREMENT
Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W75-08519   7A

DISCHARGE (WATER)
Response of an Unsaturated Soil to Forest Transpiration,
W75-08436   2D

Discharge Data at Water-Quality Monitoring Stations in Arkansas,
W75-08519   7A

Discharge, Slope, Bed Element Relations in Streams,
W75-08794   2E

Meter for Sewer Flow Measurement,
W75-08850   7B

DISINFECTION
Split Chlorination: Yes-No,
W75-08568   5D

DISPERSION
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W75-08435   2F

Dispersion Effect on Buoyance-Driven Convection in Stratified Flows Through Porous Media,
W75-08447   2F

Non-Equalibrium Thermodynamic Treatment of Transport Processes in Ground-Water Flow,
W75-08488   2F

Empirical Data on Longitudinal Dispersion in Rivers,
W75-08495   5B

Dispersion and Movement of Tritium in a Shallow Aquifer in Mortandad Canyon at the Los Alamos Scientific Laboratory,
W75-08645   5B

DISSOLVED ORGANICS
An Examination of the Concentration of Organic Components Water-Extracted From Petroleum Products,
W75-08454   5A

DISSOLVED OXYGEN
Environmental Effects of Dredging and Spoil Disposal,
W75-08465   5C

Spectrophotometric Determination of Dissolved Oxygen Concentration in Water,
W75-08551   5A

Investigation of Rational Effluent and Stream Standards for Tropical Countries,
W75-08584   5G

DISTILLATION
Method of Distilling Sea Water on Small Ships and Marine Platforms Having Internal Combustion Engine,
W75-08737   3A

Method of Apparatus for Treating Sewage,
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Distillation Apparatus,
W75-08763   3A

DISTRIBUTION
Classification and World Distribution of Vegetation Relative to V/Stol Aircraft Operations,
W75-08366   7B

The Distribution of Intraperitoneally Injected Cadmium-115M in Chickens,
W75-08533   5A

DISTRIBUTION PATTERNS
Some Comments on Testing Random Topology Stream Network Models,
W75-08437   2E

DIURNAL RAINFALL DISTRIBUTION
Precipitation Characteristics in the Northeast Brazil Dry Region,
W75-08421   2B

DOMESTIC WATER
Water Conservation by the User,
W75-08360   3D

DORCHEAT BAYOU (ARK)
Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Dorcheat Bayou, Segment 1A,
W75-08837   5B

DOSIMETRY
Natural Radiation Exposure in the United States,
W75-08669   5A

Method and Apparatus for Surface Skimming,
W75-08741   5D

FLOW
A Theory for Water Flow Through a Layered
Snowpack,
W75-08441   2C

A Two Layer Flow Through a Contraction,
W75-08701   8B

On the Time-Dependent Flow in a Lake,
W75-08703   2H

Flow Field Surrounding a Suction Pipe Inlet,
W75-08799   8B

General Considerations of Flow in Branching
Conduits,
W75-08805   8B

Flow Through Trifurcations and Manifolds,
W75-08807   8B

Characteristics of an Air-Water Mixture in a
Vertical Shaft,
W75-08815   8B

FLOW CHARACTERISTICS
General Considerations of Flow in Branching
Conduits,
W75-08805   8B

Combining Flow in Branches and Wyes,
W75-08806   8B

FLOW CONTROL
Design of Cooling Tower Return Channel for
TVA's Browns Ferry Nuclear Plant,
W75-08803   5D

FLOW RATES
Measurement of the Horizontal Component of
Ground Water Flow Using a Vertically Posi-
tioned In-Situ Thermal Probe,
W75-08490   2F

FLOW RESISTANCE
Analysis of Flow in Channels with Gravel
Beds,
W75-08793   8B

FLOWMETERS
Meter for Sewer Flow Measurement,
W75-08850   7B

FLUID FRICTION
Reducing Fluid Friction with Okra,
W75-08605   8G

FLUID MECHANICS
Heat Transfer and Fluid Mechanics of the
Thermal Pollution Problem,
W75-08599   5B

Cavitation Damage Scale Effects--State of Art
Summarization.
W75-08698   8B

FLUIDIZED-BED
Reduction of Atmospheric Pollution by the Ap-
plication of Fluidized-Bed Combustion and
Regeneration of Sulfur Containing Additives,
W75-08642   5A

FOG
Artificial Fog Produced by Industrial Emission
of Water Vapor (Brouillards artificiels produits
par emission industrielle de vapeur d'eau),
W75-08545   5A

FOLIATION
The Origin of Foliation in Glaciers: Evidence
from Some Norwegian Examples,
W75-08410   2C

FOOD CHAINS
The Role of Planktonic Protozoa in the Marine
Food Chain: Seasonal Changes, Relative
Abundance, and Cell Size Distribution of Tin-
tinnida,
W75-08589   5C

FORAGE GRASSES
Effects of Date and Depth of Planting on the
Establishment of Three Range Grasses,
W75-08546   3F

FORECASTING
Effect of Atmospheric Stability and Wind
Direction on Water Temperature Predictions
for a Thermally-Loaded Stream,
W75-08576   5B

A Technique for the Prediction of Water De-
mand from Past Consumption Data,
W75-08730   6D

FOREST STAND
The Evaporation of Intercepted Rainfall from a
Forest Stand: An Analysis by Simulation,
W75-08442   2D

FOREST WATERSHEDS
Response of an Unsaturated Soil to Forest
Transpiration,
W75-08436   2D

FORESTS
The Evaporation of Intercepted Rainfall from a
Forest Stand: An Analysis by Simulation,
W75-08442   2D

FOSSIL BIONOMY
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